TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, 1936

No. 731

THE NATIONAL FERTILIZER ASSOCIATION, INC., ACME MANUFACTURING CO., ET AL., APPELLANTS.

vs.

W. W. BRADLEY, INDIVIDUALLY AND AS CHAIRMAN OF THE BOARD OF TRUSTEES OF CLEMSON AGRICULTURAL COLLEGE, ET AL.

APPEAL FROM THE DISTRICT COURT OF THE UNITED STATES FOR THE WESTERN DISTRICT OF SOUTH CAROLINA

FILED FEBRUARY 11, 1937.

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[fol. 1] [Caption omitted]

[fol. 2] [File endorsements omitted]

[fol. 3]

IN UNITED STATES DISTRICT COURT FOR THE WESTERN DISTRICT OF SOUTH CAROLINA

In Equity

THE NATIONAL FERTILIZER ASSOCIATION, INCORPORATED, ACME MANUFACTURING COMPANY, Aiken Fertilizer Co. (J. D. Prothro, owner), The American Agricultural Chemical Company, Anderson Fertilizer Company, Inc., Armour Fertilizer Works, Banks Fertilizer Company (a Partnership Composed of Mrs. M. L. Banks, D. H. Banks, M. H. Banks, J. A. Banks, Jr., R. W. Banks, and B. C. Banks), Blue Belt Fertilizer Company, Catawba Fertilizer Company, Chatham Chemical Company, The Davidson Chemical Corporation, Empire State Chemical Company, Inc., Etheredge Guano Company (J. Lee Etheredge, Owner), Etiwan Fertilizer Company, Farmers Fertilizer Company, Fountain Inn Mixing Company (J. A. Barry, Owner), The Hartsville Fertilizer Company, Holly Hill Fertilizer Company, International Agricultural Corporation, Logan-Robinson Fertilizer Company, Maybank Fertilizer Corporation, W. F. McLees, Merchants Fertilizer Company, Molony Fertilizer Company, Mutual Fertilizer Company, Nitrate Agencies Company, Pearsall & Company, Pendleton Oil Mill, Planters Fertilizer & Phosphate Company, Read Phosphate Company, Reliance Fertilizer Company, F. S Royster Guano Company, Smith-Wilkinson Guano Company, Inc., Southern Agricultural Chemical Corporation, The Southern Cotton Oil Company, Southern Fertilizer & Chemical Company, Southern States Phosphate & Fertilizer Company, Swift & Company Fertilizer Works, Union Oil Mill, Virginia-Carolina Chemical Corporation, Wingard Fertilizer Company, Charles P. Wray & Company (a Partnership Composed of A. B. Heins and J. S. Edmunds), Plaintiffs

against

W. W. BRADLEY, Individually and as Chairman of the Board of Trustees of Clemson Agricultural College, A. F. Lever,

J. E. Sirrine, Paul Sanders, Christie Benet, T. B. Young, R. M. Cooper, B. T. Leppard, Edgar A. Brown, Sam H. Sherard, J. B. Douthit, F. E. Cope, and W. D. Barnett, individually and as members of the Board of Directors of Clemson Agricultural College, and John M. Daniel, Individually and as Attorney General of the State of South Carolina, Defendants

[fol. 4] SUBPŒNA AD RESPONDENDUM—Filed July 22, 1936

The President of the United States of America to the Defendants Above Named:

You are hereby summoned and required to answer the bill in the above case, a copy of which is herewith served upon you, and file your answer or other defense in the Clerk's office, Greenville, South Carolina, twenty days after the service hereof, exclusive of the day of service; and if you fail to answer this bill within the time aforesaid, the plaintiff in the suit will apply to the Court for the relief demanded in the bill.

Witness, the Honorable J. Lyles Glenn, United States District Judge of the Western District of South Carolina, at Greenville, South Carolina, this 22nd day of July, A. D. 1936.

Wm. Elliott, W. C. McLain, Plaintiff's Solicitors.

W. D. White, C. D. C. U. S. W. D. S. C.

Memorandum

The respondents will take notice that they should file their answer or other defense to the Bill herein in the Clerk's office on or before the twentieth day after the service hereof, exclusive of the day of service; otherwise judgment pro confesso will be taken against them.

W. D. White, C. D. C. U. S. W. D. S. C.

[fol. 5] IN UNITED STATES DISTRICT COURT

[Title omitted]

[fol. 6] BILL OF COMPLAINT—Filed July 22, 1936

To the Honorable J. Lyles Glenn, Judge of the United States District Court for the Western District of South Carolina:

Come now the plaintiffs and for cause of action against the defendants, allege that:

First. At all times hereinafter mentioned the plaintiffs, except where otherwise indicated in the caption herein, are corporations duly organized and existing under and by virtue of the laws of one of the States of the United States, and are citizens and residents thereof. Plaintiffs, except The National Fertilizer Association, are manufacturers of fertilizer and are qualified to do, and now are doing, business in the State of South Carolina. Plaintiff The National Fertilizer Association, is a corporation having no capital stock, organized under the laws of the State of Maryland; its members are individuals, firms and corporations engaged in the manufacture and sale of fertilizers or allied businesses; its purposes and objects are the progress and development of the fertilizer industry as a whole; and its principal source of revenue consists of dues paid by its members, a number of whom are co-plaintiffs in this suit.

Second. The defendants above named, except the Defendant John M. Daniel, are members of and constitute the Board of Trustees of Clemson Agricultural College and in addition to various other duties are required by the laws of the State of South Carolina to enforce the various laws of that State relative to the analysis and branding of commercial fertilizers, including the 1936 amendment hereinafter set out in full. All said defendants are citizens and residents of the State of South Carolina and are hereinafter sometimes collectively referred to as the "Board." That Clemson Agricultural College is located in the Western District of South Carolina and is the place for the regular meetings of said Board and from which its operations with relation to fertilizer control are conducted.

Defendant John M. Daniel is the Attorney General of South Carolina and the State's chief law enforcement officer, and as such has the right to allow, in proper cases, the name of the State of South Carolina to be used by pri- [fol. 7] vate citizens for the purpose of bringing actions in the name of that State.

Third. This is a civil cause in equity, which arises under the Constitution and laws of the United States, and involves an amount in controversy, exclusive of interest and costs, in excess of Three Thousand ($3,000) Dollars, in that the property and rights of the plaintiff manufacturers sought to be protected herein, are of a value in excess of Three Thousand ($3,000) Dollars, and that the penalties

which may be imposed would be in excess of Three Thousand ($3,000) Dollars, all as is hereinafter more fully and specifically shown.

Fourth. The plaintiff manufacturers herein, for varying periods of time in the past have been, are now, and expect to continue to be, engaged in the business of selling commercial fertilizers in the State of South Carolina, and each of them has built up a valuable business in such sales.

Fifth. During the 1936 session of the General Assembly of South Carolina the following act amending the then existing fertilizer law was passed and subsequently approved by the Governor, and is now a part of the statutory law of the State and, according to its terms, becomes effective on August 1, 1936:

"AN ACT

To amend Section 6367, Code of Laws of South Carolina, 1932, as amended by Act 232 of the Acts of the General Assembly of South Carolina, 1933, entitled, 'An Act to amend Section 6367, Code of Laws of South Carolina, 1932, so as to require the specifications and the guaranteeing of the content of certain materials used in the manufacture and mixing of all fertilizers supplying certain elements and to provide a penalty for the violation of certain fertilizer contracts,' approved April 17, 1933, so as to further provide for the specification and the guaranteeing of the poundage and content of materials used in the manufacture and mixing of all fertilizers supplying certain elements."

[fol. 8] Section 1. Be it enacted by the General Assembly of the State of South Carolina: That Section 6367, Code of Laws of South Carolina, 1932, as amended by Act No. 232 of the Acts of the General Assembly, 1933, entitled, 'An Act to amend Section 6367, Code of Laws of South Carolina, 1932, so as to require the specification and the guaranteeing of the content of certain materials used in the manufacture and mixing of all fertilizers supplying certain elements and to provide a penalty for the violation of certain fertilizer contracts,' approved April 17th, 1933, be and the same is hereby amended by adding in front of the word 'that' on line one of said Section 6367 as amended the following: '(a).'

"Amend further by adding after the word 'fertilizer' at the end of said Section 6367 as so amended the following: '(b) That the amounts and analysis of each material, or source, of each plant food element used in manufacture, of a fertilizer mixture containing two or more plant feed elements be stated on a tag attached to each sack or container, such amounts of materials to be stated in pounds per hundred pounds of mixture contained in the sack or other container.

" 'This statement of pounds of materials used in the manufacture of a fertilizer mixture shall be in addition to the statement of chemical analysis as required by Section No. 6366 of the Code of Laws of South Carolina, 1932.'

"So that said Section 6367 as amended by said Act No. 232 of the Acts of the General Assembly of South Carolina, 1933, when so amended shall read as follows:

" 'Section 6367. (a) That the materials used in the manufacture and mixing of all fertilizers supplying nitrogen or ammonia, and offered for sale in this State, shall be divided into two classes, namely, water-soluble and available water-insoluble; and the percentage of nitrogen or ammonia coming from either of these two classes shall be guaranteed, but allowing a variability of one-fourth of one per cent, for goods containing two per cent of ammonia or under, and a variability of one-third of one per cent for goods containing [fol. 9] two and three per cent ammonia, and a variability of one-half of one per cent for goods containing over three per cent ammonia, and the several materials in each of these two classes shall be named on the bag or on a tag attached thereto, and it shall be permissible for the manufacturer to substitute one or more materials in either class of approximately equal agricultural value for other materials of the same class: Provided, That where there is a contract of agreement between a manufacturer and a purchaser of fertilizer that the fertilizer will be manufactured by the use of certain definite sources and amounts of ammonia and potash, the fertilizer must be manufactured from these materials without substitution of other materials and failure on the part of the manufacturer to comply with this requirement shall render the manufacturer liable to the purchaser for damages as it is now prescribed by law, and in addition thereto the manufacturer shall pay to the pur-

chaser a penalty equal to one-fourth of the purchase price of such fertilizer.

"'(b) That the amount and analysis of each material, or source, of each plant food element used in manufacture, of a fertilizer mixture containing two or more plant food elements be stated on a tag attached to each sack or container, such amounts of materials to be stated in pounds per hundred pounds of mixture contained in the sack or other container. This statement of pounds of materials used in the manufacture, of a fertilizer mixture shall be in addition to the statement of chemical analysis as required by Section No. 6366 of the Code of Laws of South Carolina, 1932.'

Section 2. That all Acts or parts of Acts inconsistent with this Act are hereby repealed.

Section 3. This Act to take effect on the 1st day of August, 1936."

Sixth. Plaintiffs are informed and believe that the defendants, and especially the Board, intend to enforce the provisions of said Act unless restrained and enjoined by this Honorable Court as hereinafter prayed.

[fol. 10] Seventh. Fertilizers are materials or mixtures of materials which contain plant foods and are customarily applied to the soil to supply plant foods for crops. The principal plant foods contained in fertilizers are nitrogen (ammonia), phosphoric acid, and potash. Other, or minor plant foods, such as calcium, sulphur, magnesium, manganese, copper, and zinc are sometimes required in a fertilizer in order to produce desired results. What constitutes the most efficient combinations of plant foods varies with the crop, the soil, and climatic conditions, or any of them.

The Statutes of South Carolina divide certain of these plant foods into classes; for example, ammonia is divided into the classes of water-soluble ammonia and available water-insoluble ammonia; phosphoric acid carriers must supply available phosphoric acid; potash is divided into carriers which furnish muriate of potash and those which furnish sulphate of potash. In order to effect the best crop results a fertilizer must consist of that combination of materials which will supply the proper amount of each class of plant food for a particular crop, type of soil, and climatic conditions.

A fertilizer formula comprises the amount and analysis of each material used in manufacturing a fertilizer mixture, or a statement thereof. The chemical reactions resulting from the mixture of certain fertilizer materials designated by a formula, otherwise satisfactory from an agronomic standpoint, often result in physical and mechanical difficulties in the factory.

That some, if not all, of the plaintiff manufacturers herein, desiring to supply their customers with the best fertilizer for each particular purpose, have conducted a great deal of research and expended large sums of money in the development of their various fertilizer formulas to be used for each agricultural crop under the varying conditions affecting the growing of such crop. Many of them, if not all, have maintained chemical laboratories and employed chemists to conduct chemical research as to the chemical reactions resulting from the mixing of fertilizer materials, and as to the ultimate reaction of such fertilizer mixtures in the soil. They have also carried on or caused to be carried on many plot tests and practical field tests with many experimental formulas on many types of soil and under most of the agricultural crops grown in South Carolina.

[fol. 11] In many instances the plaintiffs, or some of them, have donated fertilizers made according to specific formulas to state experiment stations in order that such formulas might be tested. Also fertilizers made according to certain formulas have been furnished gratis to farmers in order that practical field tests as to efficiency of the formulas might be made by such farmers, and engineers have been employed to solve the physical and mechanical difficulties encountered in developing formulas.

The plaintiffs, or some of them, have for many years employed agronomists to study the results obtained by laboratory and field research, to carry on further research, to study and evaluate the reported research data of the various State and governmental research and experimental agencies, and to correlate and consolidate all such available data to the end that the best possible formulas could be determined for each set of conditions affecting each crop.

As a result of all this study, research, and experimentation the plaintiff manufacturers have developed their own secret formulas for various crops and for various growing

conditions in the various areas, including areas in South Carolina, in which their products are sold.

Plaintiff manufacturers herein have sold their products manufactured according to their secret formulas in South Carolina for varying periods of time, in some cases for many years, and because of successful use of such products by their customers have established for such secret formulas a reputation and good will of great trade value. They have likewise expended large sums of money in advertising such products to familiarize the buying public with the satisfactory results obtained from their use by their customers and with the reputation of such products.

The South Carolina law, without the 1936 amendment herein complained of, requires the percentages of the different principal plant foods, (not the pounds of different materials) used in any fertilizer to be guaranteed on the package or a tag attached thereto, and further requires a statement of the several materials used to furnish each class of ammonia. In addition the presence of any substance deleterious to plants, if in excess of the limits prescribed by the Board, must be declared. Also the South Carolina law, without the 1936 amendment, recognizes the right of a buyer, whether dealer, farmer, or other purchaser, to contract with a manufacturer to furnish fertilizer of a speci- [fol. 12] fied formula and requires that such contract be fulfilled precisely as made, and provides heavy penalties for failure to do so. These provisions of the law and other provisions now give the buyer and the user adequate protection in the purchase and use of fertilizers.

Through the above mentioned acts and things done by the plaintiff manufacturers, plaintiff manufacturers have created valuable property and property rights in the secret formulas which they have developed over a period of years, which value on information and belief is alleged to be in excess of $3,000 in the case of each plaintiff manufacturer.

The publication by plaintiff manufacturers of their secret formulas on the fertilizer sold by them would be of no economic or agronomic value to a purchaser or user and would result in great hardship, substantial financial loss, and irreparable injury to them.

The 1936 amendment herein complained of requires the complete public disclosure of these secret formulas for any fertilizers sold after August 1, 1936, in South Carolina in

that the amendment requires that each package of fertilizer so sold must be accompanied by a statement giving in pounds per hundred pounds of mixture the amount and analysis of each such material used.

Such disclosure would completely, immediately, and irreparably destroy the property rights in such secret formulas in that full and complete knowledge thereof would be revealed with the first sale on or after August 1, 1936. In addition there are no known chemical methods by which the amounts and analysis of each material or source of each plant food element used in the manufacture of a fertilizer containing two or more plant foods can be accurately proved or disproved, and to require the publication of such amounts and analysis as required by the 1936 amendment would invite fraud and imposition upon the users of fertilizers, and might well result in injury to them rather than benefit.

The value of the secret formulas herein referred to and the good will based thereon, achieved as a result of research and the investment of large sums of money would be destroyed if said 1936 amendment should become effective.

The allegations in this paragraph as to the things done in the development of secret formulas are allegations intended to be taken as true of the plaintiff manufacturers generally, [fol. 13] and while all of the acts and things alleged to have been done may not have been done by each plaintiff referred to, yet some one or more of the acts alleged have been done by each and every of the plaintiff manufacturers.

Eighth. Plaintiffs further allege that the fines and penalties provided by law for failure to comply with the challenged 1936 amendment and the possibility of innumerable actions to enforce compliance will effectually operate to deprive, and will deprive plaintiffs of their property without due process of law in violation of the Constitution of South Carolina and the Fourteenth Amendment to the Constitution of the United States.

Ninth. Plaintiffs specifically charge and aver that said 1936 amendment is illegal, null and void, and should be set aside, annulled, and temporarily and permanently enjoined upon, inter alia, the following grounds:

(1) That said amendment is an unlawful, unreasonable, and unconstitutional exercise of the police power of the State of South Carolina in that no such law is in force and

effect in any of the States of the United States, and no such law is necessary or required for the protection of users of fertilizers, but would serve merely to satisfy curiosity, while at the same time completely and irreparably destroying the value of the herein alleged formulas of plaintiff manufacturers not only in the State of South Carolina, but in all the other states in which plaintiff manufacturers, or any of them, sell their fertilizers.

(2) That the enforcement of said amendment would constitute a taking of plaintiff manufacturers' property and property rights without due process of law, and without compensation, and deny to them the equal protection of the law in violation of the Fourteenth Amendment to the Constitution of the United States and similar provisions of the Constitution of South Carolina, the provisions of which plaintiffs specially set up and claim the protection of, all of which is more specifically and in detail set forth in the affidavits hereto attached and made a part hereof, marked exhibits "A", "B", "C", "D", etc.

[fol. 14] Wherefore, plaintiffs allege that there is no adequate redress or remedy at law available to them to protect their property and property rights against the enforcement of the said 1936 amendment, and that it is, therefore, necessary for them to come into a court of equity and invoke the extraordinary remedies of such courts to avoid a probable multiplicity of suits, and prevent irreparable injury, loss and damage to their property and property rights, and the taking thereof in contravention of the Constitutions of the State of South Carolina and the United States.

Wherefore the premises being considered, and being without adequate remedy at law plaintiffs pray this Honorable Court to grant to them a writ of subpœna directed to the above named defendants, and each and every of them, commanding them to appear in this Court, and to answer, (but not under oath, answer under oath being expressly waived) the averments of this complaint, and for the following general and specific relief:

(1) That said Act of the General Assembly of South Carolina herein referred to as the 1936 amendment, be declared to be invalid and in violation of the Constitutional rights of plaintiffs, and null and void, for the reasons hereinbefore set out.

(2) That in view of the immediate and irreparable loss and damage which will be sustained by plaintiff manufacturers by the enforcement of the provisions of said Act, and the probable multiplicity of suits to which plaintiffs may be subjected, they pray that the above named defendants, and each of them, be severally and jointly perpetually enjoined from enforcing, or from taking any steps to enforce, or giving any effect whatsoever to said 1936 amendment, and from attempting directly or indirectly to compel plaintiffs to comply with the terms and provisions thereof, and from commencing any suit or proceedings, or permitting any suit or proceeding to be taken against the plaintiffs or any of them for failure to comply with the terms of said 1936 amendment, or from permitting or allowing the agents or servants of any of defendants to take any steps to enforce said Act.

(3) Plaintiffs further pray that upon a hearing for a preliminary injunction being had, a preliminary order of injunction of like character issue, and that such injunction pendente lite be granted against each and all of said defendants, their agents and servants enjoining and restraining [fol. 15] them until final decree in all of the respects as to which a perpetual injunction is sought in the foregoing prayer; and that upon final hearing in this cause, this Honorable Court perpetually enjoin the enforcement of the provisions of said 1936 amendment, and any effort or attempt on the part of any or all of the defendants, their agents or servants to enforce the same, and to make permanent by injunction the relief hereinbefore prayed, and that this Court declare the said Act to be illegal, null and void, upon the grounds hereinbefore set forth.

(4) That, in any event, an injunction be granted, as hereinbefore prayed, restraining and enjoining the defendants, their agents or servants from any attempt upon the part of any of said defendants, their agents or servants to enforce a compliance with said Act, or to impose any fines or penalties for violation or disregard thereof, pending the final decision and order of this Honorable Court in this cause.

(5) Plaintiff manufacturers further show that they will suffer irreparable loss, damage and injury, and an illegal taking of their property, unless a temporary restraining

order is issued by this Honorable Court on or before August 1st, 1936.

Wherefore plaintiffs pray that each and all of said defendants be restrained from enforcing, or attempting to enforce, or from taking any steps to enforce, the terms and provisions of said Act, until the further order of this Honorable Court.

(6) And plaintiffs further pray for all such other and further relief, both general and specific, as the exigencies of the case may require, or to which in equity they may be entitled.

Wm. Elliott, W. C. McLain, Solicitors for Plaintiffs.
Elliott, McLain, Wardlaw and Elliott, Columbia, S. C., of Counsel.

[fol. 16] *Duly sworn to by J. Ross Hanahan. Jurat omitted in printing.*

[fol. 17] EXHIBIT "A" TO BILL OF COMPLAINT

IN THE DISTRICT COURT OF THE UNITED STATES FOR THE WESTERN DISTRICT OF SOUTH CAROLINA

In Equity

THE NATIONAL FERTILIZER ASSOCIATION et al., Plaintiffs,

against

W. W. BRADLEY, Individually and as Chairman of the Board of Trustees of Clemson Agricultural College, et al., Defendants

STATE OF SOUTH CAROLINA,
County of Richland:

Personally appeared before me P. C. Townsend, who, being first duly sworn, says:

That he is District Manager of the Virginia-Carolina Chemical Corporation, one of the plaintiffs in this action.

That the said Virginia-Carolina Chemical Corporation and predecessors have been engaged in the business of manufacturing and selling fertilisers in South Carolina for the past 35 years or more, and expects to continue to do so.

That fertilisers are materials or mixtures of materials

which contain plant foods, those chemical elements or compounds utilized by plants for nutriment; and are customarily applied to the soil to supply plant foods for crops.

That the principal plant foods so supplied are nitrogen (ammonia), phosphoric acid, and potash.

That other plant foods, commonly known as "minor plant foods," are sometimes required in a fertilizer mixture in order to produce the best results; among these "minor plant foods" are calcium, sulphur, magnesium, manganese, copper, and zinc.

[fol. 18] That what constitutes the most efficient combination of plant foods varies with the crop, the soil, and the climatic conditions, or any of them.

That the statutes of the State of South Carolina divide certain of these plant foods into classes; for example, ammonia (designated as such in the South Carolina Law though designated as nitrogen—one of the components of ammonia—in the laws of all other states) is divided into the classes of water-soluble ammonia and available water-insoluble ammonia; phosphoric acid carriers must supply available phosphoric acid; potash is divided into carriers furnishing muriate of potash and carriers furnishing sulphate of potash.

That, in order to effect the best crop results, a fertilizer must consist of that combination of materials which will supply the proper amount of each class of plant food for the particular crop, type of soil, and climatic conditions.

That a fertilizer formula comprises the amount and analysis of each material used in manufacturing a fertilizer mixture, or a statement thereof.

That the chemical reactions resulting from the mixture of certain fertilizer materials designated by a formula, otherwise satisfactory from an agronomic standpoint, often result in physical and mechanical difficulties within the factory.

That the Virginia-Carolina Chemical Corporation, desiring to supply its customers the best fertilizer for each particular purpose, has conducted a great deal of research and has expended large sums of money in the development of its various fertilizer formulas to be used for each agricultural crop under the varying conditions affecting the growing of such crop.

That the Virginia-Carolina Chemical Corporation has maintained chemical laboratories and employed chemists to

conduct chemical research as to the chemical reactions resulting from the mixing of fertilizer materials, and as to the ultimate reaction of such fertilizer mixtures in the soil.

That the Virginia-Carolina Chemical Corporation has carried on or caused to be carried on many plot tests and practical field tests with many experimental formulas on many types of soil and under most of the agricultural crops grown in South Carolina.

[fol. 19] That the Virginia-Carolina Chemical Corporation has donated fertilizer made according to specific formulas to State experiment stations in order that such formulas might be tested.

That the Virginia-Carolina Chemical Corporation has furnished fertilizer made according to certain formulas gratis to farmers in order that practical field tests might be made by them as to the efficiency of these formulas.

That the Virginia-Carolina Chemical Corporation employed engineers to solve the physical and mechanical difficulties encountered in developing formulas.

That the Virginia-Carolina Chemical Corporation has for many years employed agronomists to study the results obtained by laboratory and field research, to carry on further research, to study and evaluate the reported research data of the various State and Government research and experimental agencies, and to correlate and consolidate all such available data to the end that the best possible formulas could be determined for each set of conditions affecting each crop.

That as a result of all of this study, research and experimentation the Virginia-Carolina Chemical Corporation has developed its own secret formulas for various crops and for various types of growing conditions in the various areas in which it sells its products.

That for many years the Virginia-Carolina Chemical Corporation has sold its products manufactured according to its secret formulas and because of the very successful use of such products by its customers has established for such secret formulas a reputation and good will of great trade value.

That the Virginia-Carolina Chemical Corporation has expended large sums of money in advertising such products to familiarize the buying public with the satisfactory results obtained from their use by its customers and with the reputation of such products.

That the South Carolina Law, without the 1936 amendment, requires the amounts of the different classes of plant foods (not the pounds of different materials) used in any fertilizer to be guaranteed on the package or on a tag attached thereto, and further requires a statement of the several materials used to furnish each class of ammonia. In addition, the presence of any substance deleterious to [fol. 20] plants, if it is in excess of the limits prescribed by the Board of Trustees of Clemson College, must be declared.

That the South Carolina Law, without the 1936 amendment, recognizes the right of a buyer, whether dealer, farmer, or other purchaser, to contract with a manufacturer to furnish fertilizer of a specified formula and requires that such contract be fulfilled precisely as made.

That the above stated provisions of the law give the buyer or the user adequate protection in his purchase of fertilizers.

That the Virginia-Carolina Chemical Corporation through the acts and things done by it as aforesaid, has created valuable property rights in the secret formulas which it has developed and used over a period of years.

That the publication, as required by the 1936 amendment, of its secret formulas on the bags of fertilizer sold by the Virginia-Carolina Chemical Corporation would be of no economic or agronomic value to the purchaser or the user and would result in great hardship, substantial financial losses, and irreparable injury to the Virginia-Carolina Chemical Corporation.

That the 1936 amendment to Section 6367 of the 1932 Code of South Carolina requires the complete public disclosure of these secret formulas for any such fertilizers sold after August 1, 1936, in that such amendment requires that each package of fertilizer so sold must be accompanied by a statement giving in pounds per hundred pounds of mixture the amount of each material used in the mixture and the analysis of each such material.

That such disclosure would completely, immediately and irreparably destroy the property rights which the Virginia-Carolina Chemical Corporation has in its secret formulas, in that complete knowledge thereof would thereby be revealed.

That there are no known chemical methods by which the amounts and analysis of each material or source of each

plant food element used in the manufacture of a fertilizer containing two or more plant food elements can be accurately proved or disproved, and to require the publication of such amounts and analyses as provided in the 1936 amendment would invite fraud and imposition upon the users of fertilizers and might well result in injury to them rather than in benefit.

[fol. 21] That the value of its secret formulas and of its reputation and good will based thereon, achieved as a result of years of research and the investment of large sums of money by the Virginia-Carolina Chemical Corporation, as aforesaid, would be destroyed to the irreparable injury of said company, if the said 1936 amendment should become effective.

P. C. Townsend.

Sworn to and subscribed before me this 18th day of July, 1936. Mary G. Henagan, Notary Public for South Carolina. (L. S.)

EXHIBIT "B" TO BILL OF COMPLAINT

IN THE DISTRICT COURT OF THE UNITED STATES FOR THE WESTERN DISTRICT OF SOUTH CAROLINA

In Equity

THE NATIONAL FERTILIZER ASSOCIATION et al., Plaintiffs,

against

W. W. BRADLEY, Individually and as Chairman of the Board of Trustees of Clemson Agricultural College, et al., Defendants

STATE OF SOUTH CAROLINA,
County of Richland:

Personally appeared before me J. Ross Hanahan, who being first duly sworn, deposes and says:

That he is President of the Planters Fertilizer and Phosphate Company, one of the plaintiffs in this action.

[fol. 22] That the said Planters Fertilizer and Phosphate Company has been engaged in the business of manufacturing and selling fertilizers in South Carolina for the past 30 years.

That fertilizers are materials or mixtures of materials which contain plant foods, those chemical elements or compounds utilized by plants for nutriment; and are customarily applied to the soil to supply plant foods for crops.

That the principal plant foods so supplied are nitrogen (ammonia), phosphoric acid, and potash.

That other plant foods, commonly known as "minor plant foods," are sometimes required in a fertilizer mixture in order to produce the best results; among these "minor plant foods" are calcium, sulphur, magnesium, manganese, copper, and zinc.

That what constitutes the most efficient combination of plant foods varies with the crop, the soil, and the climatic conditions, or any of them.

That the statutes of the State of South Carolina divide certain of these plant foods into classes; for example, ammonia (designated as such in the South Carolina Law though designated as nitrogen—one of the components of ammonia—in the laws of all other States) is divided into the classes of water-soluble ammonia and available water-insoluble ammonia; phosphoric acid carriers must supply available phosphoric acid; potash is divided into carriers furnishing muriate of potash and carriers furnishing sulphate of potash.

That, in order to effect the best crop results, a fertilizer must consist of that combination of materials which will supply the proper amount of each class of plant food for the particular crop, type of soil, and climatic conditions.

That a fertilizer formula comprises the amount and analysis of each material used in manufacturing a fertilizer mixture, or a statement thereof.

That the chemical reactions resulting from the mixture of certain fertilizer materials designated by a formula, otherwise satisfactory from an agronomic standpoint, often result in physical and mechanical difficulties within the factory.

That the Planters Fertilizer and Phosphate Company, desiring to supply its customers the best fertilizer for each particular purpose, has conducted a great deal of research and has expended large sums of money in the development [fol. 23] of its various fertilizer formulas to be used for each agricultural crop under the varying conditions affecting the growing of such crop.

That the Planters Fertilizer and Phosphate Company employed chemists to conduct chemical research as to the chemical reactions resulting from the mixing of fertilizer materials, and as to the ultimate reaction of such fertilizer mixtures in the soil.

That the Planters Fertilizer and Phosphate Company has carried on or caused to be carried on many plot tests and practical field tests with many experimental formulas on many types of soil and under most of the agricultural crops grown in South Carolina.

That the Planters Fertilizer and Phosphate Company has furnished fertilizer made according to certain formulas gratis to farmers in order that practical field tests might be made by them as to the efficiency of these formulas.

That the Planters Fertilizer and Phosphate Company employed superintendents and engineers to solve the physical and mechanical difficulties encountered in developing formulas.

That as a result of all of this study, experimentation, and research the Planters Fertilizer and Phosphate Company has developed its own secret formulas for various crops and for various types of growing conditions in the various areas in which it sells its products.

That for many years the Planters Fertilizer and Phosphate Company has sold its products manufactured according to its secret formulas and because of the very successful use of such products by its customers has established for such secret formulas a reputation and good will of great trade value.

That for many years the Planters Fertilizer and Phosphate Company has expended large sums of money in advertising such products to familiarize the buying public with the satisfactory results obtained from their use by its customers and with the reputation of such products.

That the South Carolina Law, without the 1936 amendment, requires the amounts of the different classes of plant foods (not the pounds of different materials) used in any fertilizer to be guaranteed on the package or on a tag attached thereto, and further requires a statement of the several materials used to furnish each class of ammonia. In addition, the presence of any substance deleterious to plants, if it is in excess of the limits prescribed by the Board [fol. 24] of Trustees of Clemson College, must be declared.

That the South Carolina Law, without the 1936 amendment, recognizes the right of a buyer, whether dealer, farmer, or other purchaser, to contract with a manufacturer to furnish fertilizer of a specified formula and requires that such contract be fulfilled precisely as made.

That the above stated provisions of the law give the buyer and the user adequate protection in his purchase of fertilizers.

That the Planters Fertilizer and Phosphate Company through the acts and things done by it as aforesaid has created valuable property rights in the secret formulas which it has developed and used over a period of years.

That the publication, as required by the 1936 amendment, of its secret formulas on the bags of fertilizer sold by Planters Fertilizer and Phosphate Company would be of no economic or agronomic value to the purchaser or the user and would result in great hardship, substantial financial losses, and irreparable injury to the Planters Fertilizer and Phosphate Company, and would substantially increase cost to consumer.

That the 1936 amendment to Section 6367 of the 1932 Code of South Carolina requires the complete public disclosure of these secret formulas for any such fertilizers sold after August 1, 1936, in that such amendment requires that each package of fertilizer so sold must be accompanied by a statement giving in pounds per hundred pounds of mixture the amount of each material used in the mixture and the analysis of each such material.

That such disclosure would completely, immediately and irreparably destroy the property rights which the Planters Fertilizer and Phosphate Company has in its secret formulas, in that complete knowledge thereof would thereby be revealed.

That there are no known chemical methods by which the amounts and analysis of each material or source of each plant food element used in the manufacture of a fertilizer containing two or more plant food elements can be accurately proved or disproved and to require the publication of such amounts and analyses as provided in the 1936 amendment would invite fraud and imposition upon the users of fertilizers and might well result in injury rather than in benefit to them.

[fol. 25] Some consumers, and excellent farmers too, have their own formulas which they refer to fertilizer companies, and fertilizer companies make up for them. The formula is their own private individual property obtained by work on their own farms over a period of years. If fertilizer manufacturers are required to publish these individual farmers' formulas, then it might work a great hardship on them. These farmers do not want their formulas made public.

That the value of its secret formulas and of its reputation and good will based thereon, achieved as a result of years of its research and the investment of large sums of money by the Planters Fertilizer and Phosphate Company, as aforesaid, would be destroyed to the irreparable injury of said company, if the said 1936 amendment should become effective.

J. Ross Hanahan.

Sworn to and subscribed before me this 20th day of July, A. D. 1936. Mary G. Henagan, Notary Public for South Carolina. (L. S.)

EXHIBIT "C" TO BILL OF COMPLAINT

IN THE DISTRICT COURT OF THE UNITED STATES FOR THE WESTERN DISTRICT OF SOUTH CAROLINA

In Equity

THE NATIONAL FERTILIZER ASSOCIATION et al., Plaintiffs,

against

W. W. BRADLEY, Individually and as Chairman of the Board of Trustees of Clemson Agricultural College, et al., Defendants

STATE OF SOUTH CAROLINA,
County of Richland:

Personally appeared George W. Gage, who, being first duly sworn, deposes and says:

[fol. 26] I am Vice-President and Manager of Anderson Fertilizer Company, of Anderson, South Carolina, and have

been engaged in the fertilizer business since 1925. That the Anderson Fertilizer Company and its predecessors have been engaged in the manufacture and sale of a general line of fertilizers since 1898, and by virtue of experiment, research, investigation and advertising has built up a valuable business for the brands and fertilizer formulas sold by it in the States of Georgia and South Carolina.

That the formulas used by said company are worth much more than $3,000.00, which value will be absolutely destroyed if the 1936 amendment is allowed to become effective. That this destruction will come about because under said amendment the secret formulas must be published and any competitor, large or small, could, immediately after seeing the tags required by said amendment, offer the same goods, or what might be claimed to be the same goods, to the customers of said company who had been acquired over a period of years and due to salesmanship, advertising, good will and honest goods.

That in addition to the loss which will be suffered on account of the publication of its valuable formulas this company will suffer loss due to the fact that it has already made up approximately 1,200 tons of fertilizer, a large part of which was mixed before the passage of the 1936 amendment, and as to which it is now impossible to state the pounds of source material per hundred pounds, because said materials varied in chemical analysis. All these goods were made up for sale in South Carolina and cannot be sold in said State unless enforcement of said 1936 amendment is restrained and enjoined. That deponent, from his years of experience and observation is of opinion that the enforcement of the 1936 amendment will not only not benefit the users of fertilizers, but will probably result in a detriment in that unscrupulous people may claim to use a certain poundage of certain materials, and this claim cannot by any existing tests be proved or disproved.

Deponent further says that in his opinion the 1936 amendment cannot be complied with by fertilizer manufacturers using their present plants and equipment and under the conditions prevailing in the industry with respect to the purchase of materials without increasing the cost of fertilizer materially. That this is true because in the present state of the art of fertilizer manufacture a mixed fertilizer

[fol. 27] is made in the following manner; for example take a fertilizer known as 8-4-4; the materials necessary to formulate an 8-4-4 are superphosphate, ammonia, and potash; these materials must first be assembled, and would probably be purchased from all over the world; the superphosphate would be purchased or made up in the plant by treating phosphate rock from Florida with sulphuric acid in certain proportions; the phosphate rock varies in analysis; the ammonia is divided into two classes, water soluble, and available water insoluble ammonia derived from several sources varying in analysis; the potash may be derived from manure salts and muriate of potash, both of which vary in analysis. These materials are mixed together in batches of one or two tons at a time, and then dumped into a storage pile of from one thousand to five thousand tons and allowed to cure for several months before being bagged and offered for sale. By using this method better goods can be produced than would result if the goods were mixed in small quantities and immediately sold. This is true because certain chemical reactions take place which would cause goods made up in small quantities to become hard and set together and be less valuable to the farmer or user. That a compliance with the 1936 amendment, because of the variation in analysis of the component materials, would make it necessary to make up mixtures in small quantities, which in turn would require more floor space, more machinery, and more employees.

Deponent further says that no other State in the United States has such a law as the 1936 amendment.

George W. Gage.

Sworn to and subscribed before me this 20th day of July, A. D. 1936. Mary G. Henagan, Notary Public for South Carolina. (L. S.)

[fol. 28] EXHIBIT "D" TO BILL OF COMPLAINT

IN THE DISTRICT COURT OF THE UNITED STATES FOR THE WESTERN DISTRICT OF SOUTH CAROLINA

In Equity

THE NATIONAL FERTILIZER ASSOCIATION et al., Plaintiffs,

against

W. W. BRADLEY, Individually and as Chairman of the Board of Trustees of Clemson Agricultural College, et al., Defendants

STATE OF SOUTH CAROLINA,
County of Richland:

Personally appeared before me Norman L. George, who, being first duly sworn, says:

That he is Division Manager of International Agricultural Corporation, one of the plaintiffs in this action.

That the said International Agricultural Corporation and predecessors have been engaged in the business of manufacturing and selling fertilizers in South Carolina for the past 26 years or more, and expects to continue to do so.

That fertilizers are materials or mixtures of materials which contain plant foods, those chemical elements or compounds utilized by plants for nutriment; and are customarily applied to the soil to supply plant foods for crops.

That the principal plant foods so supplied are nitrogen (ammonia), phosphoric acid, and potash.

That other plant foods, commonly known as "minor plant foods," are sometimes required in a fertilizer mixture in order to produce the best results; among these "minor plant foods" are calcium, sulphur, magnesium, manganese, copper, and zinc.

[fol. 29] That what constitutes the most efficient combination of plant foods varies with the crop, the soil, and the climatic conditions, or any of them.

That the statutes of the State of South Carolina divide certain of these plant foods into classes; for example, ammonia (designated as such in the South Carolina Law though designated as nitrogen—one of the components of ammonia—in the laws of all other States) is divided into the classes of water-soluble ammonia and available water-insoluble ammonia; phosphoric acid carriers must supply available phos-

phoric acid; potash is divided into carriers furnishing muriate of potash and carriers furnishing sulphate of potash.

That, in order to effect the best crop results, a fertilizer must consist of that combination of materials which will supply the proper amount of each class of plant food for the particular crop, type of soil, and climatic conditions.

That a fertilizer formula comprises the amount and analysis of each material used in manufacturing a fertilizer mixture, or statement thereof.

That the chemical reactions resulting from the mixture of certain fertilizer materials designated by a formula, otherwise satisfactory from an agronomic standpoint, often result in physical and mechanical difficulties within the factory.

That the International Agricultural Corporation, desiring to supply its customers the best fertilizer for each particular purpose, has conducted a great deal of research and has expended large sums of money in the development of its various fertilizer formulas to be used for each agricultural crop under the varying conditions affecting the growing of such crop.

That the International Agricultural Corporation has maintained chemical laboratories and employed chemists to conduct chemical research as to the chemical reactions resulting from the mixing of fertilizer materials, and as to the ultimate reaction of such fertilizer mixtures in the soil.

That the International Agricultural Corporation has carried on or caused to be carried on many plot tests and practical field tests with many experimental formulas on many types of soil and under most of the agricultural crops grown in South Carolina.

That the International Agricultural Corporation has donated fertilizer made according to specific formulas to State experiment stations in order that such formulas might be tested.

[fol. 30] That the International Agricultural Corporation has furnished fertilizer made according to certain formulas gratis to farmers in order that practical field tests might be made by them as to the efficiency of these formulas.

That the International Agricultural Corporation employed engineers to solve the physical and mechanical difficulties encountered in developing formulas.

That the International Agricultural Corporation has for many years employed agronomists to study the results obtained by laboratory and field research, to carry on further research, to study and evaluate the reported research data of the various State and Government research and experimental agencies, and to correlate and consolidate all such available data to the end that the best possible formulas could be determined for each set of conditions affecting each crop.

That as a result of all of this study, research and experimentation the International Agricultural Corporation has developed its own secret formulas for various crops and for various types of growing conditions in the various areas in which it sells its products.

That for many years the International Agricultural Corporation has sold its products manufactured according to its secret formulas and because of the very successful use of such products by its customers has established for such secret formulas a reputation and good will of great trade value.

That the International Agricultural Corporation has expended large sums of money in advertising such products to familiarize the buying public with the satisfactory results obtained from their use by its customers and with the reputation of such products.

That the South Carolina Law, without the 1936 amendment, requires the amounts of the different classes of plant foods (not the pounds of different materials) used in any fertilizer to be guaranteed on the package or on a tag attached thereto, and further requires a statement of the several materials used to furnish each class of ammonia. In addition, the presence of any substance deleterious to plants, if it is in excess of the limits prescribed by the Board of Trustees of Clemson College, must be declared.

That the South Carolina Law, without the 1936 amendment, recognizes the right of a buyer, whether dealer, [fol. 31] farmer, or other purchaser, to contract with a manufacturer to furnish fertilizer of a specified formula and requires that such contract be fulfilled precisely as made.

That the a' ve stated provision of the law give the buyer or the user ad quate protection in his purchase of fertilizers.

That the International Agricultural Corporation through

the acts and things done by it as aforesaid, has created valuable property rights in the secret formulas which it has developed and used over a period of years.

That the publication, as required by the 1936 amendment of its secret formulas on the bags of fertilizer sold by the International Agricultural Corporation would be of no economic or agronomic value to the purchaser or the user and would result in great hardship, substantial financial losses, and irreparable injury to the International Agricultural Corporation.

That the 1936 amendment to Section 6367 of the 1932 Code of South Carolina requires the complete public disclosure of these secret formulas for any such fertilizers sold after August 1, 1936, in that such amendment requires that each package of fertilizer so sold must be accompanied by a statement giving in pounds per hundred pounds of mixture the amount of each material used in the mixture and the analysis of each such material.

That such disclosure would completely, immediately and irreparably destroy the property rights which the International Agricultural Corporation has in its secret formulas, in that complete knowledge thereof would thereby be revealed.

That as a further and specific instance of substantial financial loss to this company through the operations of the open formula law; the deponent says that in 1924 the International Agricultural Corporation, after considerable expenditure of money in conducting laboratory tests and field experiments all over the South, extending over a period of years, offered to the trade what is known as International Rainbow Cotton Fertilizer 10-4-4 under a secret formula, and secret process of manufacture, and by reason of the unusual results obtained by the use of International Rainbow Cotton Fertilizer, on the part of the farmer buyers, a widespread demand has developed for this particular grade through the cotton growing states, from a few hundred tons first manufactured in 1924 Rainbow sales have grown to thousands of tons annually.

[fol. 32] The tag attached to each bag of this particul-r grade discloses the material from which the plant food is derived; it also shows the water soluble ammonia or nitrogen, as well as the water insoluble available ammonia or

nitrogen, but does not show the percentages of materials used or the pounds of materials used.

A considerable volume of the International Agricultural Corporation business is derived from the sale of special formulas—in fact, there is not a major crop grown in the United States but that this company manufactures a special formula for under an outstanding trade name. That the publication as required by the 1936 amendment, of its secret formulas, on the bag and/or tags, sold by the International Agricultural Corporation would be of no economic or agronomic value to the purchaser or the user, and would result in great hardship, substantial financial losses and irreparable injury to this corporation.

That in addition the International Agricultural Corporation has a large tonnage of fertilizer already made up, much of it mixed prior to the passage of the 1936 amendment, which can not be sold in this State unless the enforcement of said amendment be enjoined, and deponent is informed and believes that the same is true of many if not all the plaintiffs herein.

That there are no known chemical methods by which the amounts and analysis of each material or source of each plant food element used in the manufacture of a fertilizer containing two or more plant food elements can be accurately proved or disproved, and to require the publication of such amounts and analyses as provided in the 1936 amendment would invite fraud and imposition upon the users of fertilizers and might well result in injury to them rather than in benefit.

That the value of its secret formulas and of its reputation and good will based thereon, achieved as a result of years of research and the investment of large sums of money by the International Agricultural Corporation, as aforesaid, would be destroyed to the irreparable injury of said company, if the said 1936 amendment should become effective.

Norman L. George.

Sworn to and Subscribed before me this 21st day of July, 1936. Mary G. Henagan (L. S.), Notary Public for South Carolina.

[fol. 33] [File endorsement omitted]

[fols. 34-35] In United States District Court

[Title omitted]

[fol. 36] Answer to Bill of Complaint—Filed August 11, 1936

Now come the defendants and say for answer to the bill of complaint of the plaintiffs:

First. The defendants deny all of the allegations of the complaint not herein specifically admitted.

Second. They admit the second, fifth and sixth paragraphs of the complaint.

Third. The defendants, by way of defense, allege that the 1936 amendment or "Open Formula Statute" as set out in the bill of complaint, is not an arbitrary or unreasonable exercise of legislative power, that the said Act is constitutional, reasonable and lawful and was duly enacted by the Legislature in the proper exercise of its power to protect the public and to promote the general welfare and the said regulations and methods of enforcement are consistent with due process. That the preparation and analysis of fertilizer requires scientific knowledge and supervision. The public would greatly suffer should the yield and quality of farm products be reduced by the use of inferior fertilizer. In the enactment of this statute, which is designed to promote the general welfare, the Legislature has a very broad power.

Fourth. The defendants deny that the plaintiffs are entitled to the relief demanded and allege that the public has a vital interest in the enforcement of this Act and that this Court should not grant the writ of Injunction against the enforcement of the Act.

Fifth. The defendants deny that the operation of this statute would cause loss or the taking of the property of the plaintiffs without due process. They deny that the plaintiffs are the owners of any trade-marked, patented or secret formulas and allege that this statute would in no way deprive them of the good will, advertising investment, trade name or reputation for honest goods.

Sixth. The defendants allege that the formulas used by the plaintiffs are compounds of common materials which are [fol. 37] not patented and no one of the plaintiffs is the owner or holder of a monopoly therein. That the said formulas were obtained by the combined efforts of the State of South Carolina, the United States Department of Agriculture, the fertilizer companies and the farmers of this country, all working in co-operation and no one is entitled to the exclusive knowledge of said formulas or processes.

Seventh. The defendants are informed and believe that the said statute is necessary for the protection of the farmers of the State and all others who purchase and use commercial fertilizer, in that, without the protection afforded by the said statute, it is possible for the manufacturers of fertilizer to manufacture and sell their products to farmers and others who, being ignorant of the amount and source of the ingredients composing the various plant foods, are deceived into purchasing fertilizer unsuited to the type and condition of their respective soils, and which may be actually detrimental thereto, and unsuited for the crops sought to be benefited thereby; and which, as the said defendants are informed and believe, result in great yearly losses to the users of fertilizers.

Having thus made a full answer to all the matters and things contained in the bill of complaint, defendants pray that the bill be dismissed; and for judgment for their costs in their behalf incurred.

John M. Daniel, Attorney General; J. Ivey Humphrey, Assistant Attorney General; M. J. Hough, Assistant Attorney General; Harold Major, Attorney of Counsel, Attorneys for Defendants.

[fol. 38] Affidavits in Support of Answer

AFFIDAVIT

STATE OF SOUTH CAROLINA,
County of Edgefield:

Personally comes before me J. Strom Thurmond who, being duly sworn, says that he is a resident and citizen of the County of Edgefield, State of South Carolina, and is a farmer and practicing attorney in the Town of Edgefield. That deponent is State Senator from Edgefield County and

has served in this office since January, 1933, and that while serving as a member of the State Senate he became actively identified with the passage of a law during the 1936 session of the General Assembly of South Carolina providing for the amounts and analysis of each material, or source, of each plant food element used in manufacture of a fertilizer mixture containing two or more plant food elements, to be stated on a tag attached to each sack or container, such amounts of materials to be stated in pounds per hundred pounds of mixture.

That deponent graduated from Clemson Agricultural College in the agricultural course in June, 1923, and thereafter taught vocational agriculture to high school boys and the farmers in South Carolina for a period of six years, and is thoroughly familiar with fertilizer, the different ingredients used in compounding fertilizer mixtures and the effect of the different elements contained in mixed fertilizers, and deponent feels that it is highly important that the farmers know what they are getting when buying mixed fertilizer.

That deponent considers the new Fertilizer Bill passed during the recent session of the General Assembly the most outstanding piece of legislation in behalf of the farmers that has been enacted in a decade or more. Deponent is informed that this Bill was introduced in the General Assembly eight or ten years ago and several times since then, but that the fertilizer interests opposed it bitterly and were successful in defeating it each time. The House of Representatives passed a Fertilizer Bill in 1935 which the House evidently thought embodied the Bill as passed by the Senate in 1936, as the chairman of the Agricultural Committee [fol. 39] of the House, the Honorable C. W. Josey of Lee County, and a number of other House members, told deponent that they would not have passed the Bill in the House if they had known it did not contain the amendment the Senate adopted, and the Senate amendment subsequently became law, the constitutionality of which deponent is informed is now being attacked by the National Fertilizer Association, et al.

That during the consideration of the bill in the Senate every conceivable argument was presented against it, but after due consideration, and after carrying the Bill over time after time, and after the Agricultural Committee had hearing after hearing on it, which made it probably the most

widely discussed Bill at the 1936 session, the Senate passed it by a great majority feeling that it was to the best interest of the farmers and the users of fertilizer in South Carolina.

That deponent is cognizant that it is a mistake that the production of our crops depends to such a great extent on artificial or chemical fertilizer rather than upon the sound principles of crop rotation and use of animal and green manures with only sufficient mineral fertilizer to balance deficiencies of plant food; however, the one crop system and the propaganda for the increased use of fertilizer have led farmers to the artificial feeding of the immediate crop without thought being given to the chemical, physical and biological effect such methods have upon the soil, and this practice has caused South Carolina to be one of the largest users of commercial fertilizer. It ranks third in the United States in tonnage used, being exceeded only by North Carolina and Georgia, the annual tonnage bought by South Carolina farmers ranging from 750,000 to 800,000 tons, and costing $20,000,000.00 to $25,000,000.00. This shows that South Carolina uses approximately one-eighth of all the fertilizer used in the United States, and the money value is approximately one-fourth to one-third of the value of the South Carolina cotton crop, which evidences the fact that the buying and use of commercial fertilizer is one of the major economic problems facing South Carolina farmers. The [fol. 40] spending annually of $20,000,000.00 to $25,000,000.00 for one item of crop production should be done only with a thorough understanding of every factor that effects the economical buying and efficient use of material.

That farmers should be acquainted with plant requirements, sources of plant food or materials in mixture, effect of these sources on germination and growth, and the cumulative effect of sources on the soil from a physical, chemical and biological standpoint. Under the old law the fertilizer companies were required to give the names of the sources of the different ingredients in the mixture and the total percentage of the elements therein, but a guarantee of phosphoric acid, ammonia and potash does not tell the complete story of a fertilizer mixture on the plant or the soil.

It is highly important that the farmers know the amount of each material used to supply the phosphoric acid, ammonia and potash. A practical illustration of this fact is that for the production of quality tobacco a farmer should

know the amount of chlorine and magnesium carried by the potash source. The presence or absence of calcium, magnesium, chlorine, manganese, iodine, and other so-called minor plant foods and the amounts of acid, neutral, or alkaline reacting material in the mixture is information that the farmers must have for intelligent and efficient use of artificial fertilizers.

When a farmer home-mixes his fertilizer he knows the sources and amounts of the various materials used, but the average farmer does not have the equipment to properly home-mix his fertilizer, and furthermore, he is not sufficiently informed how to properly mix them, and he is forced to purchase ready-mixed goods, and a great majority of the farmers buy their fertilizer already mixed.

That it is highly important for a farmer to know the number of pounds of each material used to supply the elements in his fertilizer. For instance, under the law of South Carolina, an 8-4-4 fertilizer means 8% phosphorus, 4% ammonia and 4% potash, and if a farmer should be truck farming he would desire for the sources of ammonia in his fertilizer mixture to be derived from quick-acting materials such as [fol. 41] nitrate of soda, sulphate of ammonia, etc., and although the fertilizer mixture would test 4% ammonia and the tag showed that the ammonia was derived from the two sources aforesaid and two others, cottonseed meal and fish meal, there would be no way in the world for the farmer to ascertain the amount or number of pounds of each of these sources in the mixture, and if the fertilizer company were so inclined it could put only one pound each of nitrate of soda and sulphate of ammonia in the mixture and derive all of the balance of the 4% ammonia in the ton of fertilizer from the cottonseed meal and fish meal, both of which are much slower acting materials, and consequently his truck crop would not get the benefit of the ammonia as it would probably be harvested before the ammonia would become available.

That another dangerous gap in the old law is this: Suppose a farmer should buy a ton of 7-5-5 fertilizer, which means the fertilizer contains 5% ammonia and the sources of the ammonia on the tag were listed as nitrate of soda, sulphate of ammonia and leather meal, the fertilizer company could place a teaspoonful of soda, a teaspoonful of sulphate of ammonia and derive all of the balance of the ammonia

from leather meal (meal made from shoe leather), which is unavailable, and certainly a farmer would not buy such a fertilizer if he was informed of the facts about the matter. A sufficient amount of the leather meal would test the 5% that the fertilizer company guaranteed the mixture to contain, but the ammonia would be unavailable and of no value to the farmer.

That it is also important for farmers to know the sources of the materials in their fertilizer because certain materials tend to remedy certain diseases or biological conditions of the soil. For instance, on soil where "rust" of cotton and "frenching" of corn are prevalent the source of the potash should preferably be sulphate of potash-magnesia, kainit or manure salts, so that magnesia will be supplied, and if other sources of potash not containing magnesia are used such as muriate of potash and carbonate of potash the magnesia will not be furnished and the "rust" and "frenching" will not be remedied. Under the old law, though, there was [fol. 42] no way to tell the number of pounds of the different materials contained in the fertilizer mixture, and a fertilizer company, if it were minded to do so, could place a spoonful of sulphate of potash—magnesia in the mixture and derive the entire balance of the potash from muriate of potash, and it would list the sources of potash on the tag as sulphate of potash—magnesia and muriate of potash and this would be entirely misleading to the farmers.

That deponent feels that the farmers need every protection that can be given them and this new fertilizer law will enable them to know exactly the number of pounds of the different materials in their fertilizer mixture and should be of great value to them in choosing fertilizer mixtures that contain the materials in proper proportions desired by them to promote the growth of particular crops or remedy certain diseases or conditions existing in their soil. There is a vital need for the new fertilizer law passed by the General Assembly of South Carolina at its 1936 session and it would be no less than calamitous for it to be declared invalid. From deponent's own experience as an agriculture teacher and a practical farmer he foresees much benefit to the farmers by the passage of this law and sincerely hopes that it will go into operation as early as possible and prophesies

that great good will result to the farmers because of its passage.

J. Strom Thurmond.

Sworn to and subscribed before me this 31st day of July, 1936. Claude Gaffney, Notary Public for South Carolina. (L. S.)

AFFIDAVIT

STATE OF SOUTH CAROLINA,
County of Darlington:

Personally appeared before me C. O. McDonald who, being duly sworn, says that he is a resident and citizen of Darlington County, S. C., and is 55 years of age; and has been engaged in farming all of his life, that he now operates farms in Sumter, Darlington, Chesterfield and Kershaw [fol. 43] Counties totaling approximately 5,000 acres; that he is familiar with the various kinds of elements entering into fertilizers and their effect upon different soils and the growth of different crops; that the old fertilizer law requiring a chemical analysis and the names of the substances entering into the elements of the fertilizer, do not furnish farmers with adequate knowledge as to the composition of fertilizer, for the reason that while the chemical analysis may come up to a certain standard, the elements upon which the analysis is based may be derived from substances unsuited to the particular type of soil, or the crop on which the fertilizer is used. As for instance an 8-3-3 cotton fertilizer is composed of 8% phosphoric acid, 3% ammonia and 3% potash. The ammonia may be derived from nitrate of soda, cotton seed meal, tankage and dried blood. If there is an insufficiency in the ammonia of nitrate of soda or some other quick growing element, the cotton would grow off very slowly, and if there should be an insufficiency of cotton seed meal or one of the slow growing substances, and the ammonia should be made up largely of nitrate of soda, the cotton would grow off rapidly but as soon as the nitrate of soda was used up there would be nothing to sustain the growing condition of the crop and as a consequence there might be a big weed but undeveloped bolls.

The same thing applies to fertilizer for truck growing and for tobacco growing and other crops. Unless the proper

amount of ingredients are used in making an element of fertilizer, the crops to which it is applied will suffer in proportion.

Fertilizer manufacturers may comply with the old law as to the chemical analysis of the fertilizer manufactured and sold, but at the same time may violate the spirit of the law, as neither those charged with its enforcement or the users of the fertilizer have any way of telling the amount of each substance entering into a fertilizer element.

Crops and soils have been endangered by application and use of fertilizer which met the requirements of the old law as to chemical analysis but which, nevertheless, did not have the [fol. 44] proper proportions of the various substances entering into the elements of the fertilizer. A number of suits have been brought in the Courts of this county, in which the question of damage to crops and soils caused by the use of fertilizer which the farmer used through ignorance of the substances in the fertilizer elements were involved. In order for the farmer to know intelligently the kind of fertilizer to select for a particular type of soil or crop, it is necessary that information be given him by the manufacturers as to the various substances entering into the elements of the fertilizer which he purchases. Unless he has this information, the selection of fertilizer on the part of the farmer is, to a large instance, guess work and may or may not cause him serious loss in crop failure and damage to his soil.

C. O. McDonald.

Sworn to and subscribed before me this 1st day of August, 1936. L. M. Yarborough, Notary Public for South Carolina. (L. S.)

AFFIDAVIT

Personally appeared before me John W. Geraty, who, being duly sworn, says: That he is a resident of Charleston County, South Carolina, and is engaged in truck farming; that he grows various kinds of truck crops including potatoes, beans, cabbage, tomatoes and other crops of a similar nature; that these crops require fertilizer of a quick growing type in order to get the best results; that the ammonia in truck fertilizers should be derived mainly from nitrate of soda, dried blood and tankage and in such form as to be

easily soluble so that it may be rapidly taken up by the crop. A fertilizer without these proportions would cause the crop to grow off slowly and cause a delay in marketing which might result in serious loss to the grower. Under the old fertilizer laws, it only required the manufacturer to state the chemical analysis of the fertilizers and the substance from which the elements were derived; the farmer had no way of determining the amount of each substance composing the fertilizer element and it is possible, and has [fol. 45] often been the case that the manufacturers of fertilizers, as deponent believes, have used substances, which while complying with the law, were detrimental to the growth of the particular crop to which they were applied, as for instance, a fertilizer which its ammonia element is derived largely from cotton seed meal would produce a very slow crop growth, which would necessarily be unsuited to the production of a potato crop or other form of truck crop which was intended to be marketed early in the season.

To remedy this defect in the law, farmers have striven for many years and the matter has been taken up on numbers of occasions with the State Legislature, but until the passage of the "Open Formula Act" all efforts to amend the laws have been unavailing. Under the "Open Formula Act" the farmer may now purchase fertilizer intelligently. He is able to know just what ingredients and the amount of which enters into the fertilizer which he purchases, that is necessary for the particular crop it is to be used for. In other words, the grower of potatoes knows whether or not the fertilizer which he applies is of the proper kind and in the proper amount. As a practical farmer I believe that the "Open Formula" statute will be a great help and benefit to the farmer, so much so, that I consider it the best piece of legislation enacted for the farmer in many years.

John W. Geraty.

Sworn to before me this 5th day of August, 1936.
Claude Gaffney, Notary Public for S. C. (L. S.)

Affidavit

State of South Carolina,
Oconee County:

Personally appeared before me J. H. Woodward, who, being first duly sworn, says:

That he is secretary of the Fertilizer Board of Control under the board of trustees of Clemson Agricultural College of South Carolina, that he has charge of the adminis-
[fol. 46] tration of the fertilizer inspection in the State of South Carolina, that in this work eight salaried fertilizer inspectors are employed, that the county agents of each of the 46 counties of South Carolina are also authorized to assist in the inspection and operation of the fertilizer laws of this State.

That he has read the 1936 amendment to the fertilizer statutes known as the "Open Formula Act", that he is familiar with the contents of the Act, that in his opinion the Act as written can be enforced and that he anticipates no trouble on the part of the manufacturers in compliance with this statute.

J. H. Woodward.

Sworn to before me this 30th day of July, 1936. Ernest Johnson, Notary Public for South Carolina. My commission expires at the pleasure of the Governor.

AFFIDAVIT

STATE OF SOUTH CAROLINA,
County of Richland:

Personally appeared before me D. B. Anderson, who, being duly sworn, says: That he is a resident of Spartanburg County, South Carolina, and that he has been actively engaged in the operation of his own farm over thirty years and has had considerable experience in the home mixing of fertilizer for his own use, using various kinds of materials and formulas according to the needs of the crops grown and the types of soil. Furthermore, he states that he is State Master of the South Carolina State Grange, a state-wide farm organization composed of approximately five thousand members. The Grange has members located in most of the counties of South Carolina. Also the South Carolina State Grange is one of the thirty-five State Units in the United States with a total membership of over eight hundred thousand in the National Grange, which is the oldest and largest national farm organization in America.
[fol. 47] He further states that as State Master of the Grange he has full authority to speak for the membership

of the Grange in South Carolina in matters of Legislation, which have been proposed and advocated by the Grange. He states that in 1934 at its Annual State Session the Grange passed certain resolutions advocating the passage of a law requiring an open fertilizer formula for South Carolina. The content of this resolution was that the amounts and analysis of each material, or source of each plant food element used in manufacture of a fertilizer mixture containing two or more plant food elements be stated on a tag attached to each sack or container, such amounts of materials be stated in pounds per hundred pounds of mixture contained in the sack or other container, and that this statement of pounds of materials used in the manufacture of the fertilizer mixture shall be in addition to the statement of chemical analysis as required by Code of Laws of South Carolina, 1932.

The Grange reiterated its stand upon this matter in its Annual Session at Clemson College in 1935.

D. B. Anderson says that he appeared in 1935 and also in 1936 before committees of the Legislature particularly before Agriculture Committee of the Senate seeking the passage of the above proposed legislation. He was accompanied at one of the hearings before this committee by fifty or more Grange members, who were representative farmers in their several communities. He states further that at this same hearing there were present representatives of approximately twenty fertilizer concerns, some of these gentlemen coming from as far as Washington, Charleston and Savannah.

He states further that this law which was passed by the Legislature in 1936 has the approval not only of the entire Grange membership, but he believes by all practical farmers engaged in the operation of farming.

D. B. Anderson states that there is a great need for this law because of the large volume of fertilizers used by the farmers of South Carolina. According to information fur-
[fol. 48] nished by certain authorities of Clemson College, North Carolina, South Carolina and Georgia consumed 53.4 per cent of the fertilizer used in 1932 in the 16 fertilizer consuming states and that it is estimated by these same authorities that a law requiring an open fertilizer formula effectively enforced would mean at least an annual savings to the farmers of South Carolina of a million dollars a year. There is a need for the law because of

the different effects which certain ingredients have on the soil and the plant life of the farmer, and unless he has the proper information which sets forth the number of pounds of these various ingredients contained in a ton, he is largely in the dark as to what type of mixed fertilizer goods which he should use, not to mention the saving to him in dollars and cents. For example: An 8-4-4 fertilizer can be made by the combination of several kinds of ingredients using several kinds of formulas and still make an 8-4-4 fertilizer. Furthermore, an open fertilizer formula would not only show the number of pounds of each of these ingredients but it would also show the number of pounds of what is termed as a "filler" in the making of a ton of fertilizer. Oftentimes this filler is composed of pure sand or perhaps other worthless materials. To illustrate how an 8-4-4 fertilizer can be made from two different formulas:

Formula No. 1;

1,000	pounds	16% acid phosphate
571	"	7% cotton seed meal
222	"	18% nitrate of soda
160	"	50% muriate of potash
1,953	pounds	
47	pounds	"filler"
2,000	pounds	8-4-4

[fol. 49] Formula No. 2:

348	pounds	46-13 ammophos A
62	"	50% urea
160	"	50% muriate of potash
570	pounds	
1,430	"	"filler"
2,000	pounds	8-4-4

It is clearly seen that it is not sufficient that the farmer should know not only the chemical analysis as now required by law, but that he should know also the number of pounds of each ingredient which goes into the making up of that kind of fertilizer because of the fluctuating prices of these

ingredients because of the effects they have upon his land and plants. It is not sufficient for the fertilizer manufacturers to state that the ammonia in the fertilizer is derived from certain mineral or organic sources, but that the number — pounds of these ingredients should be so stated. Some soils and plants need one kind of ammonia and some another. If this information is kept from the farmer he will oftentimes purchase mixed fertilizers a part of which ingredients he does not need. It has been stated that there are low grade ammoniates now on the market, which if used in too large quantities is often very detrimental to the plant, even killing it, and destroying the bacteria in the soil which help to germinate this plant. It has been stated on good authority that this is practiced by many fertilizer manufacturers in order to take care of their price levels.

The fertilizer companies have stated that they have certain secret formulas which are very old and which they claim they should not be required to reveal. However, there are many types of formulas being used by private mixers and farmers, many of these formulas are taught the farmer [fol. 50] by the County Agent, Agriculture Teachers and hundreds of them have been printed in farm bulletins from time to time. In fact many of the present day fertilizer materials are of recent origin, and it does not seem reasonable that these old out-of-date formulas which these companies refer to are of any practical value, many of which are not even used. In fact it appears there are no secret formulas.

For these and many other reasons I am firmly convinced that this open fertilizer law which was passed at the 1936 Legislature is one of the most constructive pieces of legislation passed in the interest of the farmer in a number of years, and I believe it should stand and be rigidly enforced.

D. B. Anderson.

Sworn to before me this 7th day of August, 1936.
H. G. Eidson, Notary Public for S. C. (L. S.)

Acceptance of Service of Answer

Due legal and personal service of a copy of the within Answer is hereby accepted at Columbia, S. C., this 10 day of Aug., 1936.

W. C. McLain, Attorney for Plaintiffs.

[fol. 51] IN UNITED STATES DISTRICT COURT

[Title omitted]

ORDER CALLING TOGETHER THREE JUDGES UNDER SECTION 266, JUDICIAL CODE, TITLE 28, SECTION 380—Filed July 24, 1936

The plaintiffs have made application for an interlocutory injunction which, under the provisions of Section 266 of the Judicial Code (U. S. Code, Title 28, Sec. 380), must be heard before three judges.

It is therefore

Ordered, That Hon. John J. Parker, United States Circuit Judge, and Hon. H. H. Watkins, United States District Judge, be and they are hereby called to the assistance of the undersigned, Hon. J. Lyles Glenn, United States District Judge, and the Court as thus constituted be the Court to hear and determine the said application.

It is Further Ordered, That the application for an interlocutory injunction be and the same is hereby set down for hearing before the three judges herein named as required by law at Greenville, S. C., on Monday, July 27, 1936, at 11 o'clock A. M.

J. Lyles Glenn, United States District Judge.

July 22nd, 1936.

[fol. 52] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

ORDER GRANTING TEMPORARY RESTRAINING ORDER—Filed July 27, 1936

This cause coming on to be heard before the undersigned constituting a Court of three Judges organized pursuant to Section 266 of the Judicial Code on an Application for an Interlocutory Injunction, and it appearing to the Court that the facts have not been sufficiently developed upon the Hearing this day had to enable the Court to pass upon the application in an intelligent manner, and it appearing that it is necessary to take further evidence upon the said Application,

Now, Therefore, said Application for an Interlocutory Injunction is, by the consent of the parties, continued to be

heard at the Courtroom of the Circuit Court of Appeals in Asheville, North Carolina at 10 o'clock in the fore-noon on Wednesday, August 12, 1936, at which time the parties consent that the Application for Final Injunction will also be heard and passed upon, and in the meantime, in order that the status quo may be preserved, it is, by consent of the parties,

Ordered, Adjudged and Decreed That the Defendants be, and they are, hereby temporarily restrained from taking, or authorizing to be taken, any steps to enforce the provisions of the Act complained of. The Temporary Restraining Order is to become effective upon the Complainants filing a good and sufficient Bond in the sum of One Thousand Dollars ($1,000.00), to be approved by the Clerk of this Court, conditioned that they will answer any damages which the Defendants may sustain by the granting of this Order.

John J. Parker, Senior Circuit Judge Fourth Circuit.
H. H. Watkins, United States District Judge for the Western District of South Carolina. J. Lyles Glenn, United States District Judge for the Eastern and Western District of South Carolina.

July 27, 1936.

This restraining order is continued pending the final disposition of the cause.

This Aug. 13, 1936. John J. Parker, U. S. Cir. J. H. H. Watkins, U. S. Dist. Judge. J. Lyles Glenn, U. S. Distr. Judge.

[fol. 53] STATEMENT AS TO BOND

One Thousand Dollars ($1,000.00) Cash Bond was filed with the Court on July 29, 1936, pursuant to Order of Court dated July 27, 1936.

[fol. 54] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

Statement of Evidence—Filed January 29, 1937

Testimony of Myron S. Hazen, a Witness for the Plaintiffs

MYRON S. HAZEN, being first duly sworn, testified on direct examination as follows:

At Greenville, S. C., July 27, 1936.

I have been in the fertilizer business for 27 years and am manager of the Service Division of The American Agricultural Chemical Company in charge of field research work covering all agronomic problems. I am a graduate of the Massachusetts State College, trained in agronomy and biochemistry.

The disclosure of the exact number of pounds of each plant food material required by the amendment to the South Carolina law, known as the Open Formula Amendment, will force the disclosure of our secret formulas in the following manner:

First, as to nitrogen: In order to give the court a clear background of the agronomic problems, it should be understood that there are four general types or classes of nitrogen carriers. The first is the nitrate form, of which nitrate of soda and calcium nitrate are typical examples. This type of nitrogen is immediately available for the use of all crops.

The second form or class is the ammoniacal type, of which sulphate of ammonia is a typical example. This type, while water-soluble, is not available for immediate use by many crops but must be changed over in the soil to the nitrate form before most plants can utilize it.

The third form is water-soluble organic. This must undergo decomposition and chemical change in the soil before the plant roots can absorb it.

[fol. 55] All these three forms are guaranteed water-soluble, under the old South Carolina law.

The fourth form is water-insoluble nitrogen. Decomposition of this type is slower and this form is, therefore, particularly desirable in seasons of excessive rainfall.

This form is guaranteed "available water-insoluble" nitrogen (or ammonia) under the South Carolina law without the amendment.

A combination of these four types or classes of nitrogen carriers acts to feed the crop during the various periods of growth. Nitrogen affects the leaf and stalk of the plant and assures quicker growth.

Plants have no ability to masticate their food and it must, therefore, be decomposed in the soil to usable forms before they can utilize it.

Phosphoric acid is another major plant food guaranteed under the law. The guarantee is made as to the amount of

available phosphoric acid, which is that part of the phosphoric acid content available for plant use during the first crop year.

The soluble and available major plant foods are all guaranteed available under the present South Carolina law. The nitrogen (or ammonia) is divided into two general classes, the water-soluble nitrogen which is quickly available for plant use and the available water-insoluble nitrogen which is less quickly available.

After nitrogen-carrying materials are mixed together and stored in piles to cure, chemical reactions take place which change the form of the plant foods so that at the end of the curing period the materials will not be identical chemically with their original form. A 10-4-4 grade of cotton fertilizer [fol. 56] may be manufactured in a hundred different ways, utilizing different kinds and amounts of plant food carriers. The farmer wants to know what the mixture costs. He also wants to know whether or not the plant foods it contains are available, and under the old South Carolina law this information is stated in a specific guarantee.

On sandy soil types, where leaching occurs, more of the nitrogen may be required in water-insoluble forms than would be the case on a heavy clay soil type well supplied with humus where the danger of nitrogen leaching is less.

Filler in fertilizer should be considered in three classes:

1. Natural fillers or carriers of plant foods.
2. Liming materials.
3. Make-weight materials like humus or sand.

The most important class is the natural material necessary to carry the plant food in a form which the farmer can use. Nitrate of soda, for example, one of the oldest sources of nitrogen, carries 16 pounds of nitrogen in every 100 pounds of nitrate of soda. The rest (sodium and oxygen) is nature's vehicle or filler to carry the elemental nitrogen gas in a chemical combination which enables the farmer to apply it to the soil.

Sulphate of ammonia is a chemical combination of ammonia gas and sulphuric acid in a solid crystalline form which can be handled by the farmer. Both nitrate of soda and sulphate of ammonia are well standardized.

The analysis of cottonseed meal varies. In seasons of excessive rainfall the protein content with its nitrogen content, which is the chief fertilizer value, is low. The quality

[fol. 57] of the nitrogen content of a 5 per cent cottonseed meal is just as good for feeding or fertilizing as that of the higher analysis meal. If, in figuring the formula for a 10-4-4 grade, 25 per cent of the nitrogen is required as water-insoluble nitrogen and you desired to use a 5 per cent cottonseed meal as the source, it would require 20 pounds of actual nitrogen per ton, which would mean the use of 400 pounds of 5 per cent meal to furnish these 20 pounds of organic nitrogen. On the other hand, only 250 pounds of a high nitrogen cottonseed meal analyzing 8 per cent would be required to furnish the same 20 pounds of organic nitrogen. The fertilizer manufacturer might use one carload of 5 per cent cottonseed meal and the next carload of 8 per cent meal. So long as the same poundage of organic nitrogen was obtained from cottonseed meal there would be no difference in the value of the fertilizer, irrespective of whether 250 pounds of 8 per cent meal or 400 pounds of 5 per cent meal was used. Other important nitrogen carriers are tankage, blood, and many organic materials produced by nature. There is no way whereby these natural products can be standardized. They are used on the basis of their actual plant food content.

The present South Carolina law furnishes farmers who understand fertilizer formulas all the information required to intelligently select the fertilizer they need. The amendment requires in addition that fertilizer manufacturers state the exact number of pounds of each material that goes into each 100 pounds of mixed fertilizer and the analysis of each material. There is no way whereby any manufacturer in a large-scale operation can comply with this amendment without a multiplication of floor space because each change in raw material would require a segregation of the finished product.

[fol. 58] You would have to keep a record of whether 400 pounds of 5 per cent cottonseed meal or 250 pounds of 8 per cent was used. Under the present system the finished product is analyzed chemically and it does not make any difference to the farmer whether it contains 400 pounds of 5 per cent meal or 250 pounds of 8 per cent meal. Where these quantities are used, there is no difference in the amount of the same type of nitrogen furnished by these two grades of cottonseed meal. Under the amendment, you would have to completely analyze each material used in

every mixture, keep a separate record, and segregate each mixture.

The formulas of responsible fertilizer companies are carefully prepared in advance so as to furnish those ratios of plant food which will, under average soil and weather conditions in the areas where the fertilizers are sold, give the maximum return for the dollar invested. Fertilizer companies desire to help the farmer produce crops which will enable him to pay for his fertilizer and make a profit. The crop needs and the plant food ratios are carefully determined in advance.

It makes no difference from the standpoint of plant food value whether a natural filler, which would be present in the case of a low grade cottonseed meal, or an inert filler is used. Fertilizer manufacturers have their own ideas as to the ratios of plant foods which will give the greatest possible return for the dollar invested. One of the affidavits attached to this complaint (that of Norman L. George) refers to a specific brand where a fertilizer manufacturer has spent a great deal of money in research work to develop the ratios and types of plant foods which will give the maximum return. The publication of the secret formula on which this brand of fertilizer is manufactured will destroy its value. If this detailed formula is published, any [fol. 59] competitive company can claim to copy and use it and offer to produce fertilizer of the same formula at a lower price than that charged by the company which developed this brand.

In addition to the three primary plant foods, the last 20 years have shown increasing needs for certain other plant foods. These are the so-called minor or rare elements. The college and experiment station research funds were limited. The fertilizer industry has spent thousands of dollars in research. Certain companies have put into their fertilizers quantities of other plant foods like copper, zinc, and manganese which, under certain soil and crop conditions, produce large increases. The research done by fertilizer companies enables them to add these plant foods in forms and amounts to help produce larger crops. Under the amended law this information would be open to any competitor to copy, obtain the benefit of these research expenditures, and enable every competitor to duplicate the fertilizer.

No fertilizer can take the place of lime. The fertilizer

industry, however, guarantees on the tag whether the fertilizer is acid or non-acid forming. A farmer decides to grow potatoes on a soil that is neutral. He knows that while lime does not create scab it may encourage its growth. He needs a fertilizer that is acid in reaction, and buys an acid-forming brand. On the other hand, leguminous crops need lime, and he buys for them a fertilizer guaranteed to be non-acid forming.

In so far as possible no fertilizer company uses any added filler. We use dolomitic limestone sufficient to neutralize the acids. After the ammonia in sulphate of ammonia is used by the crop, a certain amount of acid is left in the soil. The ammonia is utilized by the crop and it is necessary to apply some alkali to neutralize the sulphuric acid radicals. [fol. 60] The successful fertilizer company builds formulas to utilize those types of plant food carriers which require the minimum amount of added filler.

You are not going to take a dead mule and attempt to put it under a tender growing plant. You take off the hide and put it through processes to remove the grease and produce a tankage which will contain about 9 per cent of ammonia and 20 per cent of phosphate of lime, about half of which would be phosphoric acid. The 9 per cent of ammonia is equivalent to roughly 7¼ per cent of nitrogen.

This gives you a total of 17 per cent of plant foods as nitrogen and phosphoric acid which were in the mule before he was made into tankage. This is the gross amount of plant food which the plant can take up from this mule tankage. The rest is filler from the standpoint of the fertilizer formula. There is no way to separate the nitrogen and phosphoric acid from the meat and bones and put it into the fertilizer without these carriers or fillers. We have to handle the plant foods with their natural fillers so that these natural fillers must be used even in fertilizers with high plant food content. These products are put in by nature and there is no way of segregating them. In other words, natural fillers are the vehicles to carry the plant foods.

The question of adapting fertilizer to different types of soils and to different crops has been raised. If the farmer wants a fertilizer with a high proportion of soluble ammonia—or of insoluble ammonia—to suit his soil, the necessary information would be given him before the passage of this amendment. The tag gives it specifically in the form of

a percentage guarantee of water-soluble and of available [fol. 61] water-insoluble nitrogen.

The larger fertilizer companies employ technical agronomists. They take soil samples, analyze them, and determine the amount of native plant foods in the soil and make recommendations with respect to the fertilizer which is required for each soil and crop.

In my opinion as an expert, the enforcement of this law, if it could be enforced, would not be of benefit because it would cause so much confusion. The farmer cannot understand the law.

Under the present South Carolina law prior to this amendment, the fertilizer manufacturer is allowed to substitute one ingredient for another of the same class and of the same quality. In other words, he is permitted to substitute tankage for cottonseed meal under the present law. It does not make any difference to the farmer whether the organic nitrogen comes from tankage or from cottonseed meal. The law recognizes the productive value of the various types of nitrogen carriers and protects the farmer by limiting the substitution to carriers of like value and of the same class.

There are no chemical control methods whereby this amendment can be enforced. You would have to have a man at each factory to follow and watch the mixing. To give this information honestly would require a physical history of the mixture in each particular ton of fertilizer—in fact, in each bag. This information has no advantage to the farmer as the value of the finished fertilizer is determined by the quality of the product and the classes of plant food it contains.

Under usual manufacturing conditions there are two types of mixing. The so-called wet mixing process is the original process whereby sulphuric acid is added to finely ground phosphate rock, the source of most of the phos- [fol. 62] phoric acid in mixed fertilizers. This combination of sulphuric acid and ground phosphate rock is called superphosphate. A simple illustration of the mechanics of the wet mixing process would be the ordinary ice cream freezer. As the paddles revolve they mix the sulphuric acid and the ground phosphate rock together. This mixture is then placed in huge piles to permit curing. The sulphuric acid in the mixture attacks the phosphate rock, generates heat, and drives off the moisture.

After this superphosphate has cured it is suitable as a material to be used in the dry mixing process. The dry mixing process consists in mixing together various dry materials furnishing plant foods to make mixed fertilizer.

We discussed before a simple formula for a 10-4-4 cotton fertilizer. A mixture of this sort may be made from the following materials:

125 pounds of nitrate of soda.
80 pounds of sulphate of ammonia.
450 pounds of tankage.
1100 pounds of superphosphate.
160 pounds of muriate of potash.

1915 pounds—total.

In this mixture the extraneous filler to be added would be less than 100 pounds. Generally, fertilizer mixtures are prepared in one-ton batches, the materials being transported to the mixing machine in wheel-barrows or carts. One man would bring 125 pounds of nitrate of soda, another man 80 pounds of sulphate of ammonia, and others the 450 pounds of tankage, the 1100 pounds of superphosphate, and the 160 pounds of muriate of potash.

All of these materials are mixed together in a revolving [fol. 63] mixer. They are then discharged into an elevator, carried to overhead cars, and taken to the storage warehouse to be dumped in piles for curing.

All mixed fertilizers must be dry and granular so that they may be applied evenly by fertilizer-distributing machines. The farmer can set his distributor at 250 pounds per acre and know that he is applying approximately that amount. In order to obtain this mechanical or physical condition and permit the fertilizer to run freely in the distributor, it must be similar to corn meal.

The manufacturer must carry supplies of raw materials to be used in mixing. Each raw material must be sampled and analyzed not only for the total plant food but to determine its class. The availability of the nitrogen in each carrier, and of the other plant foods as well, must be determined.

The formula of a complete mixed fertilizer must be carefully developed to furnish not only the total plant food guaranteed but the proper ratios of the different classes

of plant foods, including the secondary plant foods sometimes called rare elements. While the ratio of plant foods in each particular form, for example nitrate nitrogen or organic nitrogen, would not be changed, and the same actual number of pounds of each form would be included in the mixed fertilizer, the exact number of pounds of each ingredient added must be changed frequently—whenever there is any variation in the analysis of even a single ingredient. As suggested earlier, it makes no difference agronomically whether 400 pounds of 5 per cent cottonseed meal was used or 250 pounds of 8 per cent cottonseed meal. Either poundage would furnish 20 pounds of organic nitrogen.

[fol. 64] After these materials are mixed they are elevated from the revolving mixer to a conveyor or car and transported to that part of the storage warehouse where the particular grade of fertilizer is stored for curing.

Where large tonnages are involved, especially in the utilization of organic carriers like blood, bone, tankage, cottonseed meal, or castor pomace, the analysis varies between relatively wide limits. There is no way by which the manufacturer can obtain an absolutely uniform supply of natural raw materials. The grade and the degree of availability of plant food in any given material is reasonably uniform. The crop-producing value of the fertilizer is not changed but the poundage of each individual ingredient must be varied according to the analysis of the raw material used.

The men running the mixer and pushing the wheelbarrows know very little about chemical content, and their activities must be carefully supervised so that correct quantities of each material are brought to the mixer. These quantities are changed as the analysis of the raw material varies.

After the chemical reactions are completed, the State chemist cannot tell whether, in the example already cited, the mixture contained 250 pounds of high grade cottonseed meal or 400 pounds of low grade cottonseed meal. Similar variations frequently occur in other major raw materials and it is, therefore, impossible to guarantee the exact number of pounds of each ingredient in a large pile of mixed fertilizer which represents a composite mixture of numerous different ingredients. During the past 70 years, The American Agricultural Chemical Company has spent several million dollars in research work.

[fol. 65] On cross-examination:

The statement on the bag or tag shows no guarantee with respect to the amounts of the ingredients used in the manufacture of the fertilizer but only the percentages of the plant foods.

Answering a question that has been asked: If an agronomist advises a farmer that he requires a mixture containing 400 pounds of nitrate of soda and 200 pounds of 7 per cent cottonseed meal and, on account of soil acidity, no sulphate of ammonia, the present tag would not show exactly whether or not he was obtaining that mixture; but such a formula would have to be custom mixed and the farmer would be protected by existing law as a matter of contract.

If a pile of 5 to 10 thousand tons of an 8-3-3 grade contained only nitrate of soda, cottonseed meal, fish scrap, tankages, and muriate of potash, it would be possible to tell from the mixing records the average number of pounds of each raw material used and the average analysis of the same. You could not, however, obtain sufficient fish scrap or cottonseed meal of identical analysis to mix such a quantity. It is unusual to get even two carloads (40 tons) of identical analysis.

In purchasing so-called 7 per cent cottonseed meal, the manufacturer pays on the basis of the actual analysis. One carload may run 7.29 per cent and the next 7.33 per cent. If you ordered 7 per cent meal and obtained 7.33 per cent meal this variation would have to be taken into account in figuring the formula.

Sulphate of ammonia carries an average of 20 per cent of nitrogen, cyanamid an average of 22 per cent, and commercial urea an average of 43 per cent. The cost of nitrogen in nitrate of soda is usually from 10 to 20 cents per [fol. 66] unit (20 pounds per ton) higher than either sulphate of ammonia or cyanamid.

The prices of cottonseed meal fluctuate widely but, in general, natural organics are much more expensive than inorganic or synthetic sources.

In addition to the synthetic cyanamid, nitrate of soda is now produced synthetically in Virginia and sulphate of ammonia is produced both synthetically and as a by-product of the coke ovens. The continuous use of sulphate of am-

monia tends to increase the acidity of the soil because of the effect of the residual sulphuric acid. The effect of soil acidity on cotton is not as acute as on certain other crops because cotton grows best on fairly acid soil. Most agronomists recommend a pH value (soil acidity expressed in terms of hydrogen-ion content) between 5.3 and 5.8 for cotton. In mixed fertilizers dolomitic limestone is added to prevent sulphate of ammonia and other salts from further acidifying the soil. If soil analysis shows that the farmer's soil is too acid, the cheapest and most effective way to correct this condition is to purchase dolomitic limestone, apply it broadcast on the field to distribute it evenly, and plow it under before planting the cover crop. Accurate measurements for determining the amount of residual acidity in terms of the pH value can be made. If a farmer's land got in a very acid condition I would recommend the use of a fertilizer guaranteed to be non-acid forming. There is a tag attached to each bag of fertilizer with a specific guarantee as to whether it is acid-forming or non-acid forming.

Our company has spent large sums of money in research and in the development of different formulas. We have [fol. 67] cooperated with the United States Department of Agriculture, Clemson College, and various farmers throughout the country. Our present formulas were developed largely as a result of field tests, coupled with our own independent research. In this way we have developed most of our secret formulas. Our company has a large number of registered trade-marks. I am unable to state off-hand which of our trade-marks are registered in the State of South Carolina.

The fertilizer tag which has been exhibited shows the water-soluble ammonia equivalent of nitrogen to be 85 per cent and to be derived from nitrate of soda, sulphate of ammonia, urea, fish scrap, and tankage. There is no way of telling how much, in pounds, of any of these items is in any one of the bags. You can test chemically for the amount of nitrogen, but you cannot tell how many pounds of fish scrap or tankage is in there by analyzing. If a farmer wanted his fertilizer to contain a certain number of pounds of a certain material, that could be arranged by contract with the manufacturer, under the old law.

On redirect examination:

The disclosure of the poundage used by a fertilizer company would not destroy the reputation of that company, but if the formula became known and was obtained by a competitor it might destroy the company's business.

If any large number of farmers were to demand a large amount of blood in their fertilizers this would increase the cost of blood because of the limited supply of this material. The same would be true of any other ingredient demanded by the farmer to the exclusion of other plant food carriers [fol. 68] and would thereby tend to increase the price of fertilizers to farmers in general. There is no practical way whereby a large fertilizer company could economically formulate fertilizers to meet the whims of all of 100,000 farmers.

Independent records would have to be kept on every ton of fertilizer in order to comply with the statute. Each lot would have to be segregated and could not be mixed with other lots.

At Asheville, N. C., August 12, 1936.

On direct examination:

In the center of paragraph 3 about the ninth line on page 4 of the affidavit signed by Mr. Thurmond appended to the answer in this case, the statement is made that between 750,000 and 800,000 tons of fertilizer are consumed annually in South Carolina. According to the figures released by the Inspection Service of Clemson College, fertilizer tax tags for approximately 585,000 tons were sold during the fiscal year ended June 30, 1936. All fertilizer companies carry a limited stock of tax tags on hand for use in excess of those actually used, and the best industry figures indicate approximate sales of 550,000 tons based on the tax tag sales and the normal inventory of tax tags on hand in representative plants for the fiscal year ended July 1, 1936.

Based on the experience of a number of manufacturers doing business in South Carolina, the average net return including both mixed fertilizers and raw materials applied directly to crops would not exceed $21 per ton. This would indicate a total annual value of approximately $12,000,000 and not between $20,000,000 and $25,000,000 as stated by

Mr. Thurmond. The figures given by Mr. Thurmond were [fol. 69] applicable prior to the depression but not now.

In the fourth paragraph of page 5 of Mr. Thurmond's affidavit he states, "When a farmer home mixes his fertilizer he knows the sources and amounts of the various materials used, but the average farmer does not have the equipment to properly home mix his fertilizer, and furthermore he is not sufficiently informed how to properly mix them, and he is forced to purchase ready-mixed goods, and the great majority of farmers buy their fertilizer already mixed."

In the next paragraph Mr. Thurmond states his idea of what an 8-4-4 means, indicating that the 8 per cent means the amount of phosphorus. The South Carolina law specifically refers to phosphoric acid. The actual phosphorus content would be slightly above 3 per cent. There is confusion in Mr. Thurmond's mind as to what the guarantee really means. If he, a farmer of more than average ability, buys raw materials which he thinks he wants and cannot take these materials and mix them up because of his lack of information, what benefit would he obtain if all the information was listed on the tag? It would seem to add to the confusion rather than to clarify the picture.

Any farmer can have a fertilizer mixed and designate to the manufacturer how many pounds of each material shall go into the mixture both under the old law and under the amendment. My company makes mixtures of this sort for farmers.

On page 6, paragraph 2, Mr. Thurmond states, "Suppose a farmer should buy a ton of 7-5-5 fertilizer, which means the fertilizer contains 5 per cent of ammonia, and the sources of the ammonia on the tag were listed as nitrate of soda, sulphate of ammonia, and leather meal, the fertilizer company could place a teaspoonful of soda, a teaspoonful [fol. 70] of sulphate of ammonia, and derive all of the balance of the ammonia from leather meal (meal made from shoe leather), which is unavailable, and certainly a farmer would not buy such a fertilizer if he was informed of the facts about the matter."

The present South Carolina law specifically prohibits the use of any material deleterious to plant growth. Furthermore, both by law and by regulations, all plant foods must be available. The nitrogen classes, water-soluble nitrogen

and available water-insoluble nitrogen, must be guaranteed on the tag so that the farmer may know accurately the percentage of each class of nitrogen.

The tests for the availability of insoluble nitrogen are prescribed by the Association of Official Agricultural Chemists of North America, which includes all the State chemists and representatives of the United States Department of Agriculture. This Association is recognized as a fair, competent body to define the methods to be used in obtaining accurate analyses.

The present South Carolina law prohibits the use of leather unless and until by processing, either physical or chemical, or both, its nitrogen has been made available for plant use. Originally the fertilizer industry was a scavenger or by-product industry utilizing the by-products of packing houses, fisheries, and other industries for the benefit of agriculture. The treatment of leather, hair, and wool waste to make it available for plant use is sound conservation.

The difference in digestibility, from the standpoint of plant usage, between raw, untreated leather and tankage prepared therefrom to make the plant food available would be similar to the difference between a raw potato and one thoroughly cooked and seasoned. Not only leather, hair, [fol. 71] and such articles, but by-product tankage containing unavailable nitrogen must be processed to make the plant food available before they can be sold in South Carolina. In other words, the farmer is adequately protected both as to the quantity and as to the quality of the plant foods which may be used in the manufacture of a mixed fertilizer.

As to Mr. Thurmond's statement in the last paragraph on page 6 of certain typical examples of rust on cotton and frenching of corn: There is a wide difference of opinion on the part of plant pathologists and agronomists with respect to the causes of the various types of rust on cotton. Certain types seem to be cured by increased application of potash; there are other types reported that do not respond to that treatment and which require antiseptics or fungicides to prevent the injury. There has also been some recent work, still unfinished, by the North Carolina Experiment Station which indicates possibly boron may help to control rust on cotton. While large quantities of boron are deleterious,

small quantities may be required under certain conditions to control certain types of rust. In a problem as complicated as this, involving both the science of plant pathology and agronomy, it would seem rather questionable, even with the knowledge of all of the ingredients entering into the fertilizer, if any practical farmer would be more capable of determining the cause of solving the problems which the best technical minds of the State experimental workers are still investigating.

He also mentions frenching of corn. Frenching is a rather general term applied by farmers. The original application of the term with respect to crop growth so far as I am advised started about 25 years ago on citrus groves in Florida. Frenching is due primarily to climatic conditions, a [fol. 72] restricted moisture supply and/or absence of certain types of minor plant foods. It is not unlike rosette disease of pecan trees. They are all difficult to identify and particularly difficult to cure. In case of some of the citrus deficiencies, frenching is probably one of the most serious problems for both plant pathologists and agronomists. They require a long-time study. I would rather question Mr. Thurmond's ability to select materials that would cure it.

Sulphate of potash-magnesia is a combination which carries low percentages of sulphate of potash and epsom salts. It has no advantage agronomically over any other source of soluble magnesia but usually costs more per unit of soluble magnesia. It is used under certain conditions in tobacco formulas and truck formulas where there is acute magnesia shortage. Most experiment stations recommend dolomitic limestone because it furnishes a cheap source of available calcium and magnesium. It also neutralizes the acidity, and this type of treatment may be better than to try to supply it in fertilizers.

The affidavit by Mr. Geraty on page 9 indicates confusion in his mind or a lack of practical knowledge with respect to the accepted definitions of availability. Mr. Geraty indicates that in his opinion the ammonia in a truck crop fertilizer should be derived mostly from nitrate of soda, dried blood, and tankage, as such forms, in his opinion, are rapidly taken up by the crop. Agronomic classification, which has already been introduced in evidence, indicates the tankage, for example, is chiefly valuable because of the

large amount of water-insoluble nitrogen to feed the crops during the latter part of the growing season. The majority of the truck crop fertilizers sold in the Charleston area where Mr. Geraty operates are guaranteed to contain [fol. 73] 85 per cent of water-soluble nitrogen and only 15 per cent of available water-insoluble forms. There is a small demand for the so-called 50-50 mixture in which half of the nitrogen is derived from water-soluble forms and half from available water-insoluble forms.

All of the experimental evidence, both Federal and State, emphasizes the importance of the classification of nitrogen rather than the sources. In other words, a guarantee broken down to indicate the type of nitrogen, which the farmer now receives on the tag required by the present law, gives him all the information he requires for the intelligent use of fertilizer.

Ten or more different State experiment stations working in cooperation with the United States Department of Agriculture and the National Joint Committee on Fertilizer Application have found from recent experimental work that the placement of fertilizer with respect to the seed or the seed piece in the case of potatoes or the plants with respect to cabbage, cauliflower, tomatoes, and egg plants, may make a greater variation both in the quantity of the crop produced and in the quality than any variation in the source of the material used.

The J. H. Woodward affidavit on page 10 expresses the view, without any technical confirmation to indicate the methods to be used, that the law can be enforced. Expert testimony indicates that there is no known chemical method to determine the actual number of pounds of each ingredient which has entered into a fertilizer mixture.

If this new open formula statute means that the complete analysis of each ingredient in the fertilizer and the poundage must be shown, then it refers not merely to the three major plant foods, phosphoric acid, ammonia (nitrogen), [fol. 74] and potash, but includes calcium, chlorine, magnesia, and all the others. As a practical matter this would get down to ounces or fractions of an ounce per 100 pounds in many cases.

The amendment provides "the amount and analysis of each material, or source, of each plant food element used in the manufacture, of a fertilizer mixture containing two or

more plant food elements be stated on a tag attached to each sack or container, such amounts of materials to be stated in pounds per hundred pounds of mixture contained in the sack or other container."

The reading of the law and the affidavits included in the answer indicate that one of the reasons for the passage of the socalled Open Formula Amendment was to require not only a statement of the poundage of each material but also the chemical analysis. If the law means what it says, in order to comply with it and show the complete analyses of all of the recognized secondary plant foods which improve the quality or increase the quantity, we would have to analyse not only for nitrogen or its equivalent, ammonia, available phosphoric acid, and potash, but also for magnesium, calcium, manganese, zinc, iron, nickel, cobalt, and probably half a dozen others of similar significance. Copper would definitely be included.

If a material containing a mere trace of some minor element were included, it would have to be expressed on the bag or tag in parts per million or as milligrams. For example, boron, which is recognized as a vital element, would probably be present in the fifth decimal place in the case of nitrate of soda. If this law means what it says, and South Carolina farmers want to know not only the three major plant foods and the analysis of each ingredient in terms of [fol. 75] major plant foods but also the minor plant foods, it would require an expense of at least $50.00 per sample for complete analytical work.

The tags we are now using in South Carolina would not show the presence of boron in the fertilizer, and Judge Parker has suggested that perhaps the failure to show the presence or absence of minor plant foods was in the minds of the legislators when the amendment was enacted. We are in a period of growth with respect to fertilizer knowledge and are all seeking one thing—to mix a fertilizer which will produce a maximum yield of the highest kind of quality at the lowest possible cost to the farmer. The introduction of minor elements is a comparatively recent development. On soils well supplied with humus of a correct pH value, where good crop management and rotation is maintained and saves the native plant foods, the rare element deficiencies do not occur as frequently as on the lighter soil types.

My company, for instance, has spent a great deal of money doing research and experimentation with reference to certain minor elements. We have found some of them to be useful in fertilizers and have included them in some of our secret formulas. We feel that, like other information, this information is our own property and that we are entitled to protection in its use. If a company is obliged to tell the exact quantity and analysis of the materials used in its formulas, the property value that has been created by its research will be turned over to its competitors.

We keep our formulas secret. Neither the farmers nor our competitors know their composition. And we do not know the composition of our competitors' formulas, though we have spent a good many dollars trying to find out. Not only are the materials and sources of the minor plant foods [fol. 76] we use kept secret but also the proportions of the well known major plant food carriers.

There is no difficulty in obtaining general information as to a formula, but there is no possible way of determining, either chemically or microscopically, the exact source of the materials used in a mixed fertilizer. After the fertilizer has been cured in the pile, it is not chemically or physically like the materials which were used in its manufacture. Chemical changes take place whereby certain of the plant food radicals which are added to the mixture in one form may be changed over to another form because of their greater affinity for that particular radical.

Some minor plant foods could be very harmful if improperly compounded. The South Carolina law gives protection against the use of deleterious substances. It gives Clemson College the authority to determine whether or not substances are deleterious and to set the limit on the amounts that may be included. As a practical proposition the fertilizer manufacturer, because of his knowledge of the inherent dangers of certain ingredients or from too great concentration of even the best plant food carriers, always works toward the minimum rather than the maximum of such substances. In law he is liable for any damage he does through the furnishing of improper or deleterious material, and his business future would be destroyed.

Time is a factor in rendering available certain elements which are present in fertilizer. For instance, the cheapest source of magnesium is dolomitic limestone. If you use it

in fertilizer mixed in the early fall for the next spring potato trade, the reaction in the pile while the goods are stored will make part of the magnesium present available, [fol. 77] by transforming it into the form of magnesium sulphate, which is epsom salts. Similar changes take place with respect to other plant food carriers.

The larger the curing pile, the greater the increase in the heat. In order to obtain the heat for curing fertilizers you must batch a sufficient quantity to insulate the inside of the pile and include various chemical combinations that will produce these reactions to generate the heat.

The fertilizer is mixed far in advance of the shipping date, but as shipment starts additional supplies must be mixed as the old stock is depleted so as to give this new supply an opportunity to complete its chemical reactions and to cure out. There is no practical way whereby we can comply with this law by giving an average of the year's operations, as the list of the materials used and the analysis of the same will vary.

On cross-examination:

My honest opinion as a farmer and as an agronomist is that the open formula law would serve to confuse the farmer and would not be helpful. The average farmer lays no claim to being a chemist, and in spite of all the efforts made by the extension service to educate them it is difficult for the average farmer to tell you or me what the information already given him on the fertilizer tag really means. If you added to this a complicated statement of the analysis and poundage of each ingredient, you would merely confuse him. The trend of legislation all over the country has been towards simplification and clarity—on the theory that if you give a farmer the essential information you will do him more good than if you give him an excess of technical details.

[fol. 78] Testimony in Rebuttal

On direct examination:

Mr. Hamilton made the statement that in his opinion a single formula containing 200 pounds of 16 per cent superphosphate, 100 pounds of cottonseed meal, 50 pounds of nitrate of soda, and 100 pounds of 30 per cent manure salts

would make a fertilizer that would meet the requirements of all of the cotton farmers in the State of South Carolina. Subsequently, he added 50 pounds of dolomitic limestone to that formula. The records of Clemson College indicate clearly that there is a variety of soil types in South Carolina and that the fertilizer requirements of the light sandy soils of the Seaboard area are unlike the requirements in the Piedmont sections, on account of differences both in acidity and in organic or humus content. Mr. Hamilton contradicted himself with respect to the "Black Jack" soils and admitted or stated that in his opinion that soil would require more potash than the ordinary soils of the upland. On the question of minor plant food elements, the testimony given by Mr. Hamilton seemed to be contradictory in that he indicated in his general statement that they had no value and then went on to recite specific cases where he in his own experience had found it was necessary in order to grow successful crops to add certain definite rare, unusual, secondary, or minor plant foods, as you may choose to name them.

Mr. Geraty testified that in the manufacture of by-product tankage there may be or are certain chemicals unnamed by him which are deleterious. In the manufacture of any standard by-product tankage, every ingredient going into that mixture is tested not only for its specific plant food content but also with respect to any possible deleterious substances. The fear was expressed by the witness with [fol. 79] respect to the possible injury resulting from the use of sewage tankage or milorganite. As a practical proposition, there is only one large manufacturer of sewage tankage in the United States, which is the Milwaukee Sewerage Commission. All of that material, the solid portion of the sewage, is diluted with thousands of gallons of soapy water so that any minor impurity in the way of mercuric chloride or any other antiseptic which might for any reason be introduced into the sewerage system would be washed away in the liquid portion of the sewage and there is no possibility of deleterious substances being left in the remaining matter. It should be borne in mind in this connection that the standard method for treating seed potatoes to prevent the possibility of scab or rhisoctonia, two of the most important diseases which are carried on the skins of seed potatoes, includes the use of a mixture of mercuric chloride (corrosive sublimate) as a standard treatment for their

prevention. So such a dilute solution in the sewage could not possibly be injurious.

He also mentioned bacterial content of this tankage. In order to make this tankage available as a plant food and to protect health, whether it is packing house or by-product tankage, and in order to comply with health regulations promulgated by the Federal and State health services affecting interstate and intrastate shipments, the materials must be treated at a high temperature that will absolutely destroy all bacteria.

Statements made both by Mr. Hamilton and by Mr. Geraty with respect to the possibility of using standardized materials are inaccurate and incorrect.

Originally, as I stated in earlier testimony, fertilizer in- [fol. 80] dustries depended very largely on by-products as a source of their organic ammonia. Chemistry has taught sugar manufacturers to use blood for clarification. Packing house tankage largely is used as poultry and hog feed. Cottonseed meal is one of the highest grade carriers of high protein feed for cattle. So the fertilizer industry is forced into this position—with the normal manufacture of from 7,500,000 tons to around 8,000,000 tons of fertilizer annually, it becomes necessary for the fertilizer industry to obtain these different classes of raw materials where they can obtain them and the natural products with their wide variations in analysis do not lend themselves to standardization.

The weather conditions and the amount of rainfall in the course of a season increase the variation in the demand for the different grades of fertilizer and hence for the materials that compose them. It is impossible for the manufacturers of 550,000 tons of fertilizer used in South Carolina to get enough of the standard materials to run on a straight line formula and carry the exact analysis and amount of each of the raw materials in the entire output of the fertilizer as I stated. It would result in the disuse and waste of valuable materials conserved under present practice. It is possible, in the case of a special brand which commands a premium, to obtain a limited quantity of standard materials which you make up into a standard pile and adhere to that formula, but you are out of the market when that supply is sold. But fertilizer manufacturers and agronomists in general recognize the classes of different materials and their availability in sequence of plant food release. This basis of the

problem is understood and recognized. After all, it is a question of availability and the economic necessity of keeping the costs of fertilizer on a basis which will return to [fol. 81] the farmer the dollar he invested in the fertilizer and a reasonable profit on the investment; otherwise there is no incentive for him to use fertilizer.

Reference has been made to the use of cyanamid. When it is introduced into mixed fertilizer containing phosphoric acid, the cyanamid breaks down and forms new compounds, urea and phosphate of ammonia. When the mixed fertilizer has been properly cured, the cyanamid is not in its original form but in the form of these two well-recognized plant food carriers. When cyanamid is applied alone direct to the soil in excessive amounts for cotton or on any crop with sensitive foliage, heat and moisture will cause ammonia to evolve so rapidly that foliage injury by ammonia poisoning may result. Cottonseed meal applied alone may produce similar results under similar conditions.

A defense witness stated that it was not necessary to analyze for the minor plant food known as chlorine because you could tell from the grade of muriate of potash used what percentage of chlorine was in the mixture. As to that, I should like to point out that different shipments of 50 per cent muriate of potash which I have had analyzed by our chemists for use in experimental work have varied from as low as 41 per cent to almost 50 per cent chlorine so that even in that standard 50 per cent potash grade you have a variation which could be almost 25 per cent, so clearly the witness was in error when he stated any farmer could tell accurately the percentage of chlorine. Bear in mind the joint committee of tobacco experts which included all of the tobacco fertilizer specialists in the States of Virginia, North Carolina, South Carolina, Georgia, and Florida recommend that, from the standpoint of safe crop production and to [fol. 82] furnish the necessary chlorine, the amount be limited to 2 per cent per ton, or a gross total of 40 pounds to one ton of mixture or two pounds per 100 pounds of mixed fertilizer. So that a variation of 25 per cent would either deprive the farmer of the needed chlorine for the production of the type leaf he wants, or would give him an excess over what the specialists consider a sound minimum. We are working now on a very narrow line of demarcation between the amount needed and the amount which may be

injurious. This is the reason fertilizer manufacturers are inclined to question the ability of the average farmer to solve the problem of sources or grades for himself even if he were given detailed information as to pounds of materials used and their analyses.

[fol. 83] Testimony of H. C. Moore, a witness for the plaintiffs

H. C. Moore, being first duly sworn, testified as follows on direct examination:

I am at present Chief Chemist of Armour Fertilizer Works at Atlanta, Ga., having held that position about 15 years and having been with that company nearly 29 years. I hold the degree of Chemical Engineer from Ohio State University. It is my duty to see that the fertilizers manufactured by my company comply with the law and with the formulas we make up. Mixed fertilizers are manufactured in the following manner:

A mixed fertilizer contains the three primary essential plant foods, phosphoric acid, ammonia, or its nitrogen equivalent, and potash. The phosphoric acid is derived almost entirely from one material, namely, superphosphate. Superphosphate is a product resulting from the mixture of finely ground phosphate rock, with sulphuric acid. Phosphate rock is produced mainly, that used in South Carolina, at least, in Florida, and is shipped from the Florida mines in the form of pebble or rather coarse sand. This material is received at the fertilizer plant and ground to a very fine powder. Sulphuric acid is made at many fertilizer plants by burning sulphur which comes from Texas in the form of native brimstone or from the copper-bearing ores in the Copperhill, Tennessee, district, or from sulphur-bearing ores, such as pyrites. Superphosphate is made by mixing approximately equal weights of ground phosphate rock with 50 degree sulphuric acid. These mixtures are usually made in one ton batches. Approximately 1,000 lbs. of finely ground phosphate rock and 1,000 lbs. of sulphuric acid are weighed, transferred to suitable mixing machinery, and intimately mixed therein. A considerable chemical reaction [fol. 84] immediately takes place between the sulphuric and the phosphate rock. The mixture rises and foams and heats

up considerably. During this chemical reaction the phosphoric acid in the rock which was previously not soluble in water and insoluble and practically unavailable to plants is transformed into a product which is nearly all soluble in water and is practically all available to plants in the soil solution. After the acid and rock are mixed, the mixture while still fluid is discharged from the mixer into what we call a den. This is a closed chamber usually built of concrete, containing anywhere from 30 or 40 up to 200 or 300 tons. Then one ton charges are mixed consecutively and dumped into these dens until the dens are practically filled. This may take from one hour to nearly all day, dependent on the size of the den. After this fluid mixture is discharged into the den it soon solidifies into one solid lump. After a few minutes, say a half hour, or perhaps over night, these dens are opened and the material taken out with picks, forks, or some mechanical device. This product at that stage is quite hot and still somewhat moist. It is then conveyed to elevators and discharged from the elevator on to other conveying machinery and carried out into the fertilizer shed where it is dropped from overhead tracks into storage. The chemical reaction which began in the mixer continues in the dens and still continues in the fertilizer piles in the shed. This curing period requires in the curing shed from one month to four, five, or six months, and during this final curing period the remainder of the unavailable phosphoric acid in the rock has been gradually converted by the excess acid into a highly available form. After this curing process has been completed we have what is called cured run of pile superphosphate or the old term for the [fol. 85] same material was acid phosphate, which has in recent years been abandoned in favor of the new term superphosphate. In the curing pile superphosphate has again set up into one solid lump, and before it can be used for mixing it has to be taken out by picks, shovels, or some mechanical device or very frequently it is blasted out with dynamite. This superphosphate contains anywhere from 16% to approximately 21% available phosphoric acid; the chemical symbol is P_2O_5. The analysis or grade of superphosphate is determined by the grade of rock used in making the superphosphate. Superphosphate constitutes the large bulk of mixed fertilizer—anywhere from 40% to 75%

by weight of the bag of fertilizer is derived from superphosphate.

Potash is received by the manufacturer in finished form, in the form of salts as shown by these samples, and requires no further processing by the manufacturer before it is ready for use in the mixing of fertilizer. Potash is furnished in the form of kainit, which contains about 20% available potash, by manure salts containing from 25% to 30% potash, by muriate of potash of two grades, one of which will average from 50% to 55% potash and the higher grade from 60% to 62%; also from sulphate of potash containing approximately 50% of potash and from the double sulphate of potash and magnesia which contains about 26% to 28% potash and about 14% of magnesia.

We now come to the third and largest group of fertilizer materials, those which furnish ammonia. This group might be divided into two different classes; first, those which are readily soluble in water and by soluble in water is usually meant when a small weighed portion amounting to possibly a half or a quarter of a teaspoonful is treated with a certain quantity of water amounting approximately to an ordinary drinking glass full. If the material goes into solution [fol. 86] readily it is considered water soluble. The water soluble group of materials furnishing ammonia includes the following: Sulphate of ammonia, nitrate of soda, nitrate of potash, ammonium nitrate, urea, urea ammonia solution, cyanamid, cal-nitro, ammonium nitrate solution, nitrate of soda solution, calcium nitrate, nitrate of soda-potash, and ammonium phosphate. This list of 13 materials includes nearly all of the common water soluble forms of ammonia. This group might be further subdivided into those which furnish ammonia in the nitrate form, those which furnish ammonia in the form of ammonium salts and those which furnish it in the water soluble organic. The rates of solubility and availability of these different classes of water soluble materials vary somewhat. The other general group, the water insoluble ammonia, includes the following materials: Packing house tankage, process or nitrogenous tankage, dried blood, cottonseed meal, acid fish scrap, dried fish scrap, peanut meal, bone, Peruvian Guano, castor meal, tobacco stems, soy bean meal, sardine meal. This list of 13 materials constitutes nearly all of those water insoluble materials and while these are referred to as being

water insoluble, yet a small fraction of each of these materials is readily water soluble. This may amount to somewhere from 1/20 to 1/3 of the total ammonia present in these materials.

I have now referred to a list of the materials most generally used in the manufacture of fertilizers. To make a complete fertilizer the manufacturer must consider the agronomic property or value of the various materials to be used, that is, their availability to certain plants in certain soils under different conditions.

Phosphoric acid is derived almost entirely from one [fol. 87] material, superphosphate. Potash is derived from one or two materials usually muriate or manure salts or both, and in special formulas such as tobacco and other cases sulphate of potash, and sulphate of potash magnesia.

Ammonia is usually derived from not less than four and frequently as many as six different materials. Part of the ammonia is derived from materials furnishing ammonia in the nitrate form, part furnishing it in the form of ammonia salts, part as water soluble organic and part as water insoluble organic. These formula combinations are determined partly by agronomic needs of the plants and partly by costs of the materials themselves. A complete formula, therefore, is built up based on these various factors.

Fertilizer is usually mixed in one ton batches. There will be anywhere from 6 to 10 or 12 different materials in each batch of fertilizer. Each material is separately weighed, carried in wheel-barrows or carts to an elevator, dumped into the boot of the elevator, elevated and dumped onto screens; the coarse material which is discarded is ground up and returned to the mixture so that finally the one ton of ground material is all assembled into a mixer. These mixers resemble a concrete mixer containing baffles inside, where the materials are mixed and intermingled, finally discharged and conveyed to the storage pile in the factory. These piles are usually anywhere from 100 or 200 tons up to as much as 5,000 tons in the larger plants. These mixtures undergo a curing process which includes many chemical reactions among the fertilizer materials themselves and in this curing pile the mass sets up into one solid hard lump, so hard that it is frequently necessary to use dynamite to break down these piles in order that [fol. 88] the mixture may be finally screened, pulverized,

bagged and ready for shipment. If this curing process did not take place in the pile, it would take place in the bags and become almost as hard as a block of cement, sometimes, and wholly unsuitable for use in drilling or distributing machinery on the farms.

Certain materials are incompatible and cannot be mixed together without getting undesirable reaction to take place, and materially destroy some of the plant food present or in some cases make mixtures which are damp or sticky and unsuitable for use in fertilizer drill distribution on the farm.

Compliance with the 1936 Amendment to the South Carolina fertilizer law would necessitate making a separate storage pile every time we changed a material. For instance, cottonseed meal contains anywhere from 6 to 9 per cent of ammonia and tankage 8 to 12 per cent ammonia. Muriate of potash varies from 50 to 62 per cent, manure salts from 20 to 30, etc. All of the materials which are used in the manufacture of fertilizer, or nearly all of them, vary considerably in analysis in different lots, frequently vary widely between two consecutive carloads. The carload is usually the unit of purchase or of delivery of the various materials and if we were to receive one day a material of one analysis and tomorrow the same material of a different analysis it would mean a change in formula, and in order to show accurately the number of pounds in each bag we would have to have as many piles for storage as we have changes of analysis of all materials used in the mixture. This would decrease our storage capacity to probably 1/10 present capacity due to the small piles instead of large piles and would add enormously to operating expense.

[fol. 89] The fertilizer business is a seasonal one, nearly all is moved in 8 or 10 weeks in the spring, and in order to be prepared for the spring season materials must be assembled and converted into mixtures during the previous summer, fall and winter, to cure before shipment. This curing process is necessary if the materials now used are to be utilized. A few materials could be mixed and shipped without curing, but there is not a sufficient supply of these materials to supply the demand and if the other materials which require curing were not used, the price of the others would rise to prohibitive levels.

In order to comply with the amendment, in addition to more storage space it would be necessary to have more

machinery and more labor. Some plants will handle 30,000 to 50,000 tons in 8 or 10 weeks, and the added cost of the tags necessary to comply with the amendment would be very large, as each separate pile would require a different tag. My company has a plant at Columbia, S. C., and three plants outside the State which make shipments into South Carolina, and all these plants would be affected.

My company has valuable secret formulas, and their value would be destroyed by enforcement of the 1936 amendment. I do not believe that the information required by the 1936 amendment would be of any value to a farmer in the intelligent selection of his fertilizer.

There are ways of giving the farmer information valuable to him. It is of no importance to the farmer to know how many pounds, for example, of nitrate of soda are present in his mixture. What he really wants to know is, how much ammonia is present in the nitrate form, whether as nitrate of soda, nitrate of potash, nitrate of soda-potash, or nitrate of ammonia. Whether the ammoniacal ammonia is present [fol. 90] from sulphate of ammonia, ammonium phosphate, or ammonium nitrate is of little consequence. It is often important for him to know how much ammonia is present of the different classes I have mentioned, and this can be determined and guaranteed. Many other States require such guarantees. The Virginia law requires a guarantee of the nitrogen present in the nitrate form, but does not require a guarantee or disclosure of the amount of each source. It requires a guarantee of the amount of water insoluble nitrogen. These guarantees give the information claimed to be wanted by the advocates of the Open Formula without changing present methods of operation and without divulging the secret formulas and in a form that can be policed by the State Chemist. There is no way a chemist can determine the number of pounds of each material used in a fertilizer after it is mixed. Analysis at the end of the process will not even approximately give information necessary to check compliance with this Open Formula law. The average of the pile might be approximately correct in some cases; in others it would not. The average use of fertilizer in South Carolina is about 400 pounds per acre.

If you obtain 40 per cent of your ammonia from nitrate of soda and 60 per cent from sulphate of ammonia in an 8-4-4 fertilizer, you would apply 32 pounds of nitrate of

soda per acre and about 40 pounds of sulphate of ammonia per acre. We understand the law to mean the exact poundage and not an approximation.

I was a member, representing the manufacturers, of the committee appointed by the Governor of South Carolina to draft a satisfactory fertilizer law. I believe there were 12 members of the committee, four representing Clemson College, including the Experiment Station and the regulatory department, four prominent farmers, and four represent-
[fol. 91] ing the fertilizer industry. We had several meetings and at first all the farmers advocated the open formula, but after being shown how impractical it would be all but one or possibly two changed their opinion. Mr. Geraty continued to advocate the open formula and opposed the committee report.

The Association of Official Agricultural Chemists is an organization comprising all the State chemists and chemists from the experiment stations and from the U. S. Department of Agriculture. No members of the fertilizer industry are members of that Association. Among their activities are the development and adoption of chemical control methods to be used in regulatory work. No chemical methods have been adopted or are known by which the requirements of the open formula law can be policed.

We consider our secret formulas have great value. They are the result of years of study of materials from every agronomic standpoint and years of study of the chemical properties of the materials to determine which ones can be satisfactorily mixed together to make a good fertilizer and one in satisfactory mechanical condition so it can be applied by machinery on the farm.

If the open formula law is enforced and it is necessary to publish our secret formulas in South Carolina they would become public property in all other States, and I could not recommend that my company continue to spend money on research and experimentation, but others could take full advantage of our discoveries with no cost to themselves. In fact, there would be no incentive to continue research expense.

[fol. 92] On cross-examination:

Secret formulas change somewhat, the poundages must vary as the analysis of the material varies. They are im-

proved as new information is obtained by research or otherwise. Our company uses in general the common materials enumerated, though sometimes other valuable materials are used at no extra charge.

The Virginia law does give more information than the old South Carolina law. Certain types of soil might need more nitrogen of one particular form than some other type, but in general a combination of forms is best for any soil.

Our factories keep records of the amounts of each material used every day and how much in total was used during a season. Many chemical changes take place in a pile of fertilizer during the curing process, but we formulate our mixtures so there is no loss of plant food. We comply with the present South Carolina fertilizer law and the Virginia law, and we can comply with the open formula amendment if we disregard the expense. When a 5,000-ton batch is finished, we could make an arithmetical calculation on a 100-pound basis.

It is not often that crop results will show a difference when different organic materials are used. I do not think a potato crop would show any different- between cottonseed meal and blood. Both the company's general good will and their formulas have distinct value. Enforcement of the open formula law would enable a competitor at least to claim to be supplying the same mixture that we are making as the result of years of study, but should not affect our reputation for honest dealing.

[fol. 93] There are a number of companies that have developed formulas in approximately the same way our company has developed our formulas, using all available information, our private research, and experimentation, and the results of State and national experiment stations.

On redirect examination:

Each company would probably develop a slightly different formula for a specific purpose. The South Carolina fertilizer law without the amendment provides that a farmer can have his fertilizer manufactured from exactly specified number of pounds of each material he desires and provides heavy penalties for a manufacturer who fails to manufacture it as agreed.

The Clemson representatives on the Governor's committee recommended that the guarantees be made on the classes

of nitrogen rather than the poundage of material, as they felt that this was all the information that was of any benefit to the farmer and also the only guarantee they could check and determine whether the manufacturer had met his guarantee. We know how much of each material is contained in the pile, but we could not tell how much or if any of a certain material was contained in any 100-pound sack taken from that pile. A 5,000-ton pile would be perhaps 60 feet in width, 30 to 40 feet high, and as long as is necessary. Mixed fertilizer weighs 60 to 65 pounds per cubic foot.

In answer to Judge Parker's question in which he assumed it would be sufficient compliance with the law to put on the sack both the poundage that went into the original pile and the approximate poundage that went into the sack, I would say that, with the history of the fertilizer that we have, we could arrive only at the average of what was in the pile of which the sack was a part. In other piles where [fol. 94] different materials were used it might be that none of the particular material would be in a certain bag even if the average was in the pile.

It would be extremely expensive to comply with the law if strictly enforced. If you take the general average of the entire pile as being compliance it could be given without much expense, but then it would mean nothing at all. One particular bag might have more of some certain material included in the pile average.

The weather has a great effect on the results obtained from fertilizer on crops, especially if a large proportion of the nitrogen present is in water-soluble form. It is necessary to guarantee the amount of water soluble ammonia contained in fertilizer and if a manufacturer guaranteed a considerable proportion of water soluble ammonia in a truck fertilizer and only put in a small portion as suggested in Mr. Thurmond's affidavit it could be readily determined by the control chemist, and the manufacturer would be subject to heavy penalties.

On cross-examination:

The difficulties and expense of enforcement and compliance were explained to the legislative committees before passage of the act.

I have prepared three formulas for obtaining the ammonia in an 8-4-4 grade. In one of the formulas set forth

below, (#3) four materials were used, in one (#1) five, and in the third (#2) six. The results are practically the same agronomically and chemically, yet in one formula (#1) sulphate of ammonia was used and in another (#3) that material was not used at all. In one combination (#1) I have used sulphate of ammonia and nitrate of soda to furnish the water soluble ammonia. In another (#2) I have used sulphate of ammonia and calnitro, entirely dif- [fol. 95] ferent formulas. In each formula the amount of ammonia in the nitrate form is the same, and that is true also of the other forms of nitrogen.

All of these formulas might be used in the manufacture of fertilizer stored in one large pile, the fertilizer from one formula being found in one part of the pile and that from another formula in another part. Or each of the formulas might be used separately in the building of three separate piles. In any event, so far as known, fertilizer from every part of the large pile and fertilizer from the three separate piles would all be of identical agricultural value. In the history of the 5,000-ton pile the total of each of these several materials would be shown, and each sack from that pile chemically and agronomically would be practically identical, yet some bags might not contain, for instance, any sulphate of ammonia at all. Though made of different materials the resulting product would all have the same availability and neither the farmer nor the crop could tell any difference between them.

Judge Parker asked if I were making piles of 8-3-3 for cotton, would I not put the same amount of nitrate of soda in each of two 5,000-ton piles. My answer is that I would put the same amount of actual ammonia in nitrate form, but it might not be nitrate of soda in each case.

[fol. 96] EXHIBIT "A"

8-4-4 Formula #1:

	Units	Ammonia per Ton		
	Total	Ni- trate	Water-in- soluble	Water- soluble
165 lbs. Sulphate of Ammonia	2.09			2.09
90 lbs. Nitrate of Soda	.84	.84		.84
50 " Fish Scrap	.17		.09	.08
100 " Cottonseed Meal	.40		.36	.04
100 " Packinghouse tankage	.50		.35	.15
	4.00	.84	.80	3.20

		Units Ammonia per Ton			
		Total	Ni-trate	Water-in-soluble	Water-soluble
	8-4-4 Formula #2:				
110 lbs.	Sulphate of Ammonia	1.40			1.40
123 "	Calnitro	1.68	.84		1.68
25 "	Fish Scrap	.08		.04	.04
100 "	Castor Meal	.30		.27	.03
50 "	Cottonseed Meal	.20		.18	.02
70 "	Nitrogenous tankage	.34		.31	.03
		4.00	.84	.80	3.20
	8-4-4 Formula #3:				
135 lbs.	Ammonium Nitrate Solution	2.99	.84		2.99
25 lbs.	Peruvian Guano	.20		.14	.06
100 "	Soya Bean Meal	.45		.40	.05
75 "	Packinghouse tankage	.36		.26	.10
		4.00	.84	.80	3.20

On recross-examination:

I did not intend to state that every 8-4-4 formula is the same agronomically. What I did state was that the three which I introduced in evidence were identical agronomically. There are many different 8-4-4 formulas. Different soils and crops may possibly demand different formulas of 8-4-4 but they do not necessarily do so. The formulas I introduced were agronomically identical but radically different as to the poundage and analysis of the materials used in them.

[fol. 97] Testimony of J. Rucker McCarty, a Witness for the Plaintiffs

J. Rucker McCarty, being first duly sworn, testified as follows on direct examination:

I live in Atlanta, Georgia, and am engaged in the fertilizer business; I was educated at the Georgia School of Technology, and after graduation I worked for one year as assistant to the State Chemist of Alabama. Later I was head chemist for a fertilizer concern and subsequently I

was in the stales department of another fertilizer manufacturer. For the last eight years I have been associated with the International Agricultural Corporation, at the present time in the capacity of sales manager.

For many years the International Agricultural Corporation has been engaged in developing a special formula for each of the major crops grown in the United States. One of these, for example, is our "Rainbow" cotton fertilizer. We have spent a great many thousands of dollars over a period of years in research, experimentation, and advertising. We feel that we have a considerable monetary interest in our different formulæ for all fertilizers that we make. We feel also that the monetary value of "Rainbow" fertilizer is worth more to our company than formulæ we use in the manufacture of our regular goods.

We get a premium of $1.00 per ton on every ton of "Rainbow" sold, the analysis of which is 10-4-4, over and above our regular 10-4-4. Our annual sale of "Rainbow" in the Southeast averages from 40,000 to 50,000 tons.

We feel that if we are forced to state the number of pounds of each ingredient going into "Rainbow" fertilizer [fol. 98] the value of that particular fertilizer to the International Agricultural Corporation will be destroyed and the company will be deprived of a valuable asset. The formula of our "Rainbow" fertilizer is secret, and I would say conservatively that this secret "Rainbow" formula is worth $250,000 to us.

The estimated value of the secret formula for "Rainbow" includes the formula itself and the trade-mark because they are inseparable and it is hard to assign a value to one without the other, but this is apart from the general good will of the International Agricultural Corporation.

My company more than others has specialized in making particular fertilizers for particular crops. We have special brands for tomatoes, tobacco, peaches, and most of the major crops grown in the country. Each of these particular fertilizers brings a premium above the market price of a similar analysis made for regular consumption.

The proportion of materials we use in "Rainbow" is different from the proportion of materials used in our other fertilizers, and there are materials that go into "Rainbow" which do not go in our regular 10-4-4.

The International Agricultural Corporation has on hand

		Units Ammonia per Ton			
		Total	Ni-trate	Water-in-soluble	Water-soluble
	8-4-4 Formula #2:				
110 lbs.	Sulphate of Ammonia	1.40			1.40
123 "	Calnitro	1.68	.84		1.68
25 "	Fish Scrap	.08		.04	.04
100 "	Castor Meal	.30		.27	.03
50 "	Cottonseed Meal	.20		.18	.02
70 "	Nitrogenous tankage	.34		.31	.03
		4.00	.84	.80	3.20
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135 lbs.	Ammonium Nitrate Solution	2.99	.84		2.99
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100 "	Soya Bean Meal	.45		.40	.05
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On recross-examination:

I did not intend to state that every 8-4-4 formula is the same agronomically. What I did state was that the three which I introduced in evidence were identical agronomically. There are many different 8-4-4 formulas. Different soils and crops may possibly demand different formulas of 8-4-4 but they do not necessarily do so. The formulas I introduced were agronomically identical but radically different as to the poundage and analysis of the materials used in them.

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was in the stales department of another fertilizer manufacturer. For the last eight years I have been associated with the International Agricultural Corporation, at the present time in the capacity of sales manager.

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We get a premium of $1.00 per ton on every ton of "Rainbow" sold, the analysis of which is 10-4-4, over and above our regular 10-4-4. Our annual sale of "Rainbow" in the Southeast averages from 40,000 to 50,000 tons.

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The estimated value of the secret formula for "Rainbow" includes the formula itself and the trade-mark because they are inseparable and it is hard to assign a value to one without the other, but this is apart from the general good will of the International Agricultural Corporation.

My company more than others has specialized in making particular fertilizers for particular crops. We have special brands for tomatoes, tobacco, peaches, and most of the major crops grown in the country. Each of these particular fertilizers brings a premium above the market price of a similar analysis made for regular consumption.

The proportion of materials we use in "Rainbow" is different from the proportion of materials used in our other fertilizers, and there are materials that go into "Rainbow" which do not go in our regular 10-4-4.

The International Agricultural Corporation has on hand

in excess of 1,000 tons of fertilizer manufactured prior to April 6, 1936, for sale in South Carolina. If this law is enforced this fertilizer would have to be shipped out of the State and reformulated, which would cause the company a loss of about $6.00 per ton.

Suppose we use a general average and that we would put on all of the tags that this material contained so many pounds, for instance, of sulphate of ammonia. Now sulphate of ammonia is a material that can be detected in fertilizer. If Clemson College secured one of those particular bags or tons of fertilizer that happen to go out made of [fol. 99] materials that contain no sulphate of ammonia, and it showed on the tag that that particular fertilizer contained sulphate of ammonia, to my mind we would be in direct violation of the Open Formula law.

We have in excess of 1,000 tons on hand in piles. We have the history of the piles. If we have a pile of 8-3-3, we do not have storage rooms in our plant to take care of another season on orders of 8-3-3, so we make up a quantity of that particular fertilizer. When we use one-half or one-third of it, we dump more of the same grade but not necessarily of exactly the same materials in the same bin on top of what we have left there. Frequently during the season we replenish a pile of 8-3-3 as many as three times and sometimes oftener. We cannot tell that the last fertilizer shipped is made entirely from the last batch put in there because it becomes mixed with the preceding.

Agronomically, it would be of no information or value to the farmer to know whether he had 8-3-3 made up from the original formula or from a subsequent formula. It would not make any difference to the farmer agronomically because we put in the same amount of nitrate nitrogen, ammonia nitrogen, water soluble and the same amount of available water insoluble. We do depend, however, on seasonal conditions and what we happen to have on hand at the plant. In the case of "Rainbow" we manufacture a definite amount, in definite proportions.

I cannot conceive of any real benefit that would accrue to the farmer to have stated the number of pounds per hundred pounds of each material that makes up his plant food.

I have seen no regulations issued by Clemson College with regard to the enforcement of this new law.

[fol. 100] On cross-examination:

There can be a great deal of difference in fertilizers of the same analysis in field results. "Rainbow" 10-4-4 is better than ordinary 10-4-4 because field results prove it.

Our "Rainbow" formula has been changed slightly from time to time since we first started selling it. In part, we use the same fertilizer materials in "Rainbow" which are generally used, but as to these we claim that the proportion of the various materials used contributes to the success of the formula. That is what we claim the Open Formula law will take away from us. There is a difference between different brands of fertilizer of the same analysis.

[fol. 101] Testimony of W. T. Wright, a Witness for the Plaintiffs

W. T. WRIGHT, having been first duly sworn, testified on direct examination, as follows:

I am associated with the F. S. Royster Guano Company as Vice-President. I have been in the fertilizer business for 26 years. My training has been along the lines of practical business. After leaving the Maryland schools, I entered the employ of the Royster Company in 1910 and have been with them continuously with the exception of nine months until this time, gradually working up from a minor clerical position to the position of Vice-President.

My company has on hand unsold in its plants, 4,197 tons of mixed fertilizer manufactured prior to the passage of the Open Formula Law for sale in South Carolina. Of this fertilizer 98% is located in the Columbia, South Carolina, plant, something over 1% in the Spartanburg plant, and the balance in the Wilmington, North Carolina, plant.

The statute, if we are correctly advised of its meaning by our counsel, would make it impossible to offer any part of these mixtures for sale in South Carolina. It would be impossible to reformulate it for sale in South Carolina under the new law, because we could not accurately determine the exact number of pounds and analysis of each material and plant food element it contains. It would be necessary to move it all out of the State and reformulate it for sale elsewhere. My company already has a formulating expense of approximately $2.00 per ton in connection

with the mixing of these goods. The nearest plant to which the company could move the fertilizer would be either Charlotte or Wilmington, North Carolina. I estimate that the cost of reformulation and freight would amount to a total [fol. 102] additional expense of $7.00 per ton, or something over $28,000.

It is my understanding of the law that it requires a statement of the exact number of pounds and analysis of each material and plant food element which is used in a bag of fertilizer per hundred pounds.

The Virginia law requires the manufacturer to publish on his tag, or bag, the percentage of nitrate nitrogen, the percentage of water soluble or water insoluble nitrogen, and the percentage of organic and mineral nitrogen. These requirements can be accurately determined by modern chemistry from a policing or enforcement standpoint. In addition, the Virginia law requires a statement as to whether the fertilizer is acid or non-acid forming and the percentage of chlorine in tobacco fertilizers. That law gives the information that the advocates of the Open Formula Act want the farmer to have and gives it in a much better way.

The State Control Authorities in Virginia can accurately determine whether the manufacturer has lived up to his guarantee. Under the Open Formula Law, as I am advised by capable chemists, it is absolutely impossible after fertilizer is mixed to chemically determine and check the number of pounds of each material that composes a bag of fertilizer.

From a practical standpoint our company feels that the farmer would be at a disadvantage even in dealing with honest manufacturers, and the disadvantage would be much greater in dealing with unscrupulous manufacturers. It is the custom and policy of the Royster company to make up to stock, practically all grades of fertilizer we ship, particularly fertilizer for tobacco. We claim to be tobacco specialists. These goods are mixed in our factories any where [fol. 103] from 3 to 6 months in advance of shipment. Certain chemical reactions take place in these stock piles of fertilizer after they are mixed. In some cases the form of nitrogen is entirely changed. Before a plant can take up plant food that chemical reaction must take place either in the fertilizer plant or in the farmer's field after the fertilizer is distributed. We would be required under this new law to attach a tag to each bag showing the exact number

of pounds of each material going into its makeup. The farmer sees our tag. Even an honest manufacturer can say to him "Here, I will give you exactly the identical thing Royster gives you." Mix exactly and honestly the same materials, but he may mix it to ship quickly and it will not be the same as Royster after aging. So I think the farmer might be at a disadvantage, even in dealing with an honest manufacturer. Of course, it would be even worse with an unscrupulous manufacturer, who could claim to give him the same materials and give him something entirely different. It would be impossible for the State chemists to check up and tell exactly what materials the farmer had secured.

On cross-examination:

It is the purpose of my company in maintaining a chemical and research department to keep up with progress and my company does not hesitate to make changes in its formulas to increase the value of its fertilizers to the farmer. We work in conjunction with the different State Extension Workers and the United States Department of Agriculture but do not always agree with them as to the content of formulas. I do not think that any of the formulas mixed by my company are the result of cooperative effort with other agencies.

At times if a particularly good customer asks for special [fol. 104] formula goods and submits it, my company will make it provided it thinks he will secure good results. If it is a combination of materials that our experts say will not give good results, we refuse to mix it.

My company charges varying amounts for special mixing, about $1.50 per ton in South Carolina. The $1.50 is not necessarily extra cost of material but extra cost of manufacturing small quantities from a standpoint of overhead. The loss of time in connection with closing to clean out a mixing machine to make small quantities is expensive. If there were too many special formulas you can readily see we can not stock them for curing in our plants. If the customer is asking for large quantities, nothing is charged.

[fol. 105] Testimony of F. S. Lodge, a Witness for the Plaintiffs

F. S. Lodge, having been first duly sworn, testified on direct examination as follows:

I am technical assistant with The National Fertilizer Association. I graduated from the University of Illinois in Chemical Engineering and entered the laboratory of Armour & Company, becoming Assistant Chief Chemist to Armour & Company, and then I went with the Armour Fertilizer Works; subsequently, in charge of the chemical control, and I was later made Assistant Director of Manufacturing, a position I held about 15 years. For the last three years I have been associated with The National Fertilizer Association as Technical Assistant.

I have read the case of Corn Products Refining Company against Eddy as reported in the United States Supreme Court reports. As I understand the report of that case, the label which the Corn Products Refining Company had on the syrup which they designated as Mary Jane Syrup stated that this syrup was prepared from corn sugar or glucose, molasses and country sorghum. The Kansas Board of Health brought action to require the percentage of ingredients used in the manufacture of this syrup which they maintained was a compound syrup and not an original simple syrup; and the report of the case shows that this syrup was manufactured from 85% of corn syrup or glucose, 10% of molasses, and 5% of sorghum. Glucose is a chemical compound, but corn syrup glucose is a solution of glucose in water. Molasses is purely a generic term. It means simply a solution of some sweet material in water and may come from many sources. It is produced by the evaporation of sap of certain plants of which sugar cane and beets are most common, though many others are used. [fol. 106] So the term molasses does not designate quality or quantity and does not indicate from what source it comes. Sorghum is in the same class. When they designate it as country sorghum it is indicated that it is made by the grower of the cane on the farm, or in a small manufacturing plant. So, designating 85% glucose means there is a solution of that in water and no account of how much glucose nor of the origin of glucose which might come from corn or from syrups of whatever kind.

The 10% of molasses might have any quantity and number of different sugars and a wide varity of flavors, and the same is true of sorghum. It seems to me a disclosure of the formula 85% of glucose or corn syrup, 10% of molasses, and 5% of sorghum would be analogous to saying that fertilizer was manufactured of materials 50% bearing phos-

phate, 25% bearing potash, and 25% bearing ammonia and gives no more disclosure; whereas the present fertiliser act without the open formula amendment does give you definitely the quantity of the available plant foods and the classes of the materials and the materials furnishing those classes. The present law is very much more of a disclosure as to the actual nature of the materials themselves than the formula such as was indicated in the Corn Products case. And if the 1936 amendment is valid and enforced, it would be an even more complete disclosure of the formula.

In my opinion the Kansas statute required scarcely any disclosure whatever of the actual ingredients going into that compound syrup in that neither quantity nor quality of the available sweetness were shown. They might have used one time molasses made from Georgia cane and another time another sort grown in the Piedmont or other lands.

[fol. 107] Testimony of J. Ross Hanahan, a Witness for the Plaintiffs

J. Ross Hanahan, having been first duly sworn, testified on direct examination, as follows:

I am a fertilizer manufacturer located in Charleston, South Carolina. I was educated at South Carolina University, having been graduated from the Chemical Department and devoted the first years after graduation to analytical chemistry. Thirty years ago I assisted in forming the Planter's Fertilizer and Phosphate Company, an independent company. I have been an officer of the company since its organization and now am its president.

Until two years ago, all my company's formulae were secret, that is, they were not published. There was considerable agitation for an Open Formula two years ago and so in conjunction with one of the best experts in the State on tobacco culture, and at the request of some of our customers, we established and published a certain formula designated as Pee Dee Special Formula 8-3-6.

The formula was put out in the early spring of 1935. Upon the first shipment, competitors pulled the tag off, on which was stated the number of pounds of each material but not the analysis, and told their customers that those

materials could be bought and sold to them at a cheaper price.

It is my recollection that my company charged $2.50 up for this special formula. It was formulated so that the amount of sulphur would be very limited.

The first carload of tobacco 8-3-6 shipped out under that formula had hardly arrived at its destination before our [fol. 108] competitor picked it up and had the same thing on his the next morning.

My company went through the season under competition, having its prices cut frequently by competitors. At the beginning of the next season the same customer asked us not to print any more open formulae.

In 1936 my company put out the same grade of goods, using the majority of the same materials but not stating them on the tag. Our competitor was in the dark as to what our company was doing and we were protected by not publishing the formula.

The farmers wanted the formula closed because they felt that my company would give them the material it agreed to give them in that formula but that they were not sure when competitors came around they were giving them the same thing and there was no way for any one to know what they were getting. That would be true generally in case the Open Formula Law was held valid. If there can be enforcement of the Open Formula Law, it will be detrimental to the farmers in the end. I believe that if the legislature had passed the law that the Governor's committee drew up, they would have very valuable information that would be useful to farmers and could be enforced by analytical methods and would not harm the companies. If the law is enforced as it is written or as I understand it to be written, it is practically impossible to comply with it on a large scale. Fertilizer is a large mass production and not produced by the bag because it cannot be so produced. When you go to produce five or ten thousand tons and tell on the tag attached to the bag, as this law requires, the exact number of pounds and the exact analysis, it is impossible.

Even if you dumped it in a pile and took an average, you could not say whether that was derived from 8% or 7% cottonseed meal. To state that there is 20 pounds of cotton- [fol. 109] seed meal in that particular bag is an impossibility. So with blood and tankage.

Take our plant for illustration. It is about 70 feet wide,

30 feet high, and a 5,000-ton pile of fertilizer would be about 400 feet long. Thus you can see that it would be impossible to certify the exact amount of pounds and the exact analysis of every material that went into that pile by reason of the fact that the materials all vary in analysis as explained heretofore. We start dumping this pile from nothing, making our grade out of superphosphate that will run anywhere from 16% to 19½% available, potash running from 20% to 60%, and organic materials running in ammonia anywhere from 5% up to 16% and all fractions in each one of these materials in between the figures given.

These materials are mixed, starting in the summer and continuing through until April and May, thus making it impracticable to state the number of pounds per 100 pounds and analysis in each and every bag shipped out of this pile.

If the pile contained 5,000 to 10,000 tons, which is often the case with the standard grades, that would be 100,000-100 pounds in 5,000 tons and 200,000-100 pounds in 10,000 tons and to state that every one of these 100 pounds contained an exact analysis of each material is a practical difficulty that is insurmountable in the mass production of fertilizer. Fertilizers are produced in batches of one ton each and stored in mass. Fertilizer materials are obtained from every corner of the world.

If the Open Formula Law should confine the manufacturer to one or two materials of even analysis, then the price of these materials would rise to prices that would make the sale of fertilizer impossible to the farmer because he could not use it profitably. Sometimes blood and tankage will be [fol. 110] very high in price and the manufacturer buys fish from Japan at a lower price. Sometimes fish will be high in Japan and the manufacturer buys cottonseed meal in the United States, thus there is always an average balance on these organic materials. One organic material is approximately as good to plant life as another, provided the availability to plant life meets the requirements which the present South Carolina law requires.

In my opinion if my company attempted to comply with the Open Formula Law it would increase the cost of 8-3-3 in our plant. As I stated before, in the spring of 1935, at the request of a customer, and after going to considerable expense, we worked up a formula with a Tobacco Expert which resulted in an "open formula" for this customer on a brand which was called "Pee Dee Special 8-3-6."

No cheap or unavailable fertilizer materials, organic or otherwise, are ever used in producing commercial fertilizers for the farmer. It is a great mistake and a show of ignorance for any one to claim that unavailable materials are used in the production of fertilizers in South Carolina.

On cross-examination:

When the fertilizer manufacturer goes to put out mixed fertilizer, he can get some of his ammonias from materials costing $1.00 up to $3.00 in his formula, but he gets no credit for water soluble organic ammonia, although it costs more than mineral ammonia, under the South Carolina law at present.

Clemson College values organic water insoluble at one price and water soluble at another price, and if guarantees are not sustained by analysis, manufacturers are penalized [fol. 111] for shortage in water insoluble organic ammonia and thus the farmer is protected in getting the full value of his guarantee in high cost insoluble organic ammonia.

Home mixing and custom mixing an Open Formula are not the same thing. The Open Formula done for a customer is his own work and experience over a period of time. He comes to a manufacturer and says, "This is what my experience says I should do" and we make it up for him and it is his formula and his goods. I think it would be very unfair to have the Open Formula law passed and have that customer's work exposed to his competitors in the growing vegetable and other crops.

The law as administered now and the relation between Clemson College and the fertilizer manufacturers has always been very fair and reasonable. I am afraid of the Open Formula law because the language of the *the* statute would require a revelation of secret formulae one way or another.

This would be the picture which I dread very much—if I put on my tag that I had 200 pounds of 7% cottonseed meal in there and during the course of my manufacturing these goods, I put in, say 160 lbs. of 8% cottonseed meal—I don't know whether that makes the exact amount or not—I would ship that out; and the farmer when he grew his crop might say, "I don't believe you put this in there, and I am not paying my bill." That would mean a court action. We would go to court and it is incumbent upon him to show that we did not. He could not show that. Ultimately the

manufacturer would have to show his formula—it would be subpoenaed. He would say, "I used the same percentage derived from cottonseed meal but I only used 160 pounds of 8% meal." The farmer could say, "I did not want 8%, my crop needed a different percent." Now what the Court would say I don't know. It is a pretty serious thing to us.

[fol. 112] Testimony of Charles J. Brand, a Witness for the Plaintiffs

CHARLES J. BRAND, being duly sworn, testified as follows on direct examination:

I am Executive Secretary of The National Fertilizer Association, an organization of manufacturers of mixed fertilizer and fertilizer materials, those who handle those materials and the chemical laboratories that serve the industry. The active members are those that manufacture and the associate members are those who deal in the materials used by the industry and conduct laboratories.

The Association has almost 400 members scattered throughout the United States, many of whom are located in South Carolina where something over a half million tons of fertilizer are used yearly. The Association conducts the usual work of a national trade association, including matters relating to traffic, legislation, status of exports and imports, consumption, sales, etc. It fosters research work through fellowships in agricultural and other colleges, and generally assists in all of the common work of the industry that should be a charge upon all members in relation to the volume of business they do rather than on a few members to distribute benefit to the others at the expense of a few.

I am a graduate (1902) of the University of Minnesota. Having specialized in economic botany, I became professionally engaged in that line of work, first serving as assistant curator of botany in the Field Museum of Natural History, Chicago, and then entering the United States Department of Agriculture 33 years ago. I have spent 20 of the past 33 years in that service. For three years I was [fol. 113] general manager and vice-president of the American Fruit Growers, Inc., and for the last 11 years Executive Secretary of The National Fertilizer Association.

I have devoted myself particularly to agricultural economics, was also engaged in plant breeding and plant phy-

siological work, and later in cotton handling and marketing and paper plant investigations. Under President Wilson in 1913 I developed the Bureau of Markets, now known as the Bureau of Agricultural Economics. Still latter, from 1922 to 1925 I served as Consulting Specialist in Marketing under Secretary Henry C. Wallace; and most recently at the request of President Roosevelt, I served as coadministrator with George N. Peek of the Agricultural Adjustment Administration.

For 11 years it was my duty to deal with all problems of fertilizer legislation as they came up in State legislatures. At the present time, 43 States have fertilizer control laws. It is our duty in the Washington office to keep track of all the laws, and, as new legislation is proposed here and there, to help make it of service to the farmer without injury to the industry. In the past 11 years, members of the legislatures have come to us for expressions as to our attitude before submitting bills to their legislatures. When we have suggestions to make, we always go to the Committee concerned. We never go to the back door. We go to those men who politically, agronomically, or otherwise deal with the problems involved. We appear for hearing and present our facts before those authorized Committees charged with responsibility in the premises. In the course of that work I have appeared before many legislatures. Finally, as a result of frequent requests, we prepared, with the assistance of the chemists in our own industry, and with specialists [fol. 114] from farm organizations and experimental stations, what we considered a model fertilizer law; a law intended to yield the best possible results for the farmer and at the same time serve adequately an industry which serves the farmer.

It is of interest to know that for every dollar spent for fertilizer by the farmer, and we consulted 48,000 of them through 1,000 of our salesmen, they received $3.50 from the application of fertilizer. We found in our work before this legislation became an issue that the desire is to know what form or class of plant food it is that is of service to the plant. It is of no particular service to the farmer or anyone else to know that the nitrogen in a particular lot of fertilizer comes from sulphate of ammonia. It is not of service to know that it comes from cal-nitro or cal-urea or any other material. What is of importance is the form of the nitrogen with reference to availability to the crop and

that is what we strove to put in the model law which we have found it possible to bring before some legislatures.

In South Carolina, the legislature itself passed a resolution under which the Governor was authorized to appoint a Committee to draft a new fertilizer law, in order that we might help to prepare a well-balanced law that would give the farmer all that he must have in the way of information and would give the fertilizer manufacturer what he should have in order for the law to be practically and fairly enforceable. It is my opinion, from the standpoint of a man who has devoted all his life to agronomy, and part of the time as a farmer, that the law now under consideration will give the farmer practically nothing except to satisfy a natural curiosity on the part of some to know the precise quantity as well as the sources of the materials used, which [fol. 115] latter is already accomplished by the source tag requirement of the present law. The old law gives him all that he can use of that type of information.

It would take many lines to list in detail the fundamental elements present in superphosphate. These would have to be put on an additional sheet. Cottonseed meal also contains numerous elements and it would take some 10 or 12 lines to list them. The only thing that could possibly be of any importance to the farmer in addition to the nitrogen content would be a little potash and phosphoric acid. According to the language of the Open Formula law, when you get through you would have 8 or 10 elements shown on that formula, and each one would have to be analyzed into some 10 or 12 subordinate substances that would have to be shown on a sheet or tag if the law is enforced as written.

We waited until only a little more than a week remained before the law went into force, and I telegraphed the College, asking if the regulations had been prepared. As they had not been, obviously we could not have a copy. Thus the industry had to shut down its plants or take action. Through experiments financed by The National Fertilizer Association, a method of application was evolved of putting fertilizer two inches below and three inches to the side of the seed which gave an increased yield of 675 pounds of seed cotton over a series of years. How can such importance be laid on the disclosure of small amounts of materials when this 675 pounds of additional cotton in the seed can be obtained by merely varying the method of application?

So far as any chemist or agronomist knows, it is impos-

sible to determine analytically the amount of any material used in a fertilizer mixture. In the case of nitrate nitro-
[fol. 116] gen, for instance, if it were obtained from, say, nitrate of soda and cal-nitro, the total can be determined, but it would be impossible to tell how much came from each of the two materials—in other words, how many pounds of soda was used.

Disclosure of the rare elements means little or nothing to the American farmer as yet, but they are of importance in several secret formulas.

The disclosure required by the Open Formula law undoubtedly could be used to perpetrate a fraud on the farmer, because in the fertilizer business, as in others, a few unscrupulous persons would take advantage of it in the future as they have done in the past.

From my wider observation, I would estimate that from 100 to 150 fertilizer companies have spent money for research. I know of a small company in Florida that does less than a 10,000-ton business that has spent a large sum for research and has discovered certain things fruitful to itself and its customers. If private information of this kind is made available in South Carolina, the movement to enact similar legislation will spread elsewhere, and the property of citizens everywhere may be taken from them through a misunderstanding of what is involved.

All progressive manufacturers esteem their secret formulæ as being of great value. Even those that use common materials use them in different and unusual combinations not used by others. I am sure they regard them as of great value, and I am equally convinced that nothing that he is in justice entitled to receive will be gained by the farmer from this law.

If sufficient funds were made available, it would be possible to put a man to watch the mixing of each pile. No useful results would accrue, but it could be done.

[fol. 117] In a general way I am familiar with the fertilizer laws of other States. There is no such law as the South Carolina Open Formula law on the books of any other State. There have been efforts in other States to enact an Open Formula law, but, upon explanation of the true facts, even the proponents have withdrawn their proposals.

In my opinion the State of South Carolina could adopt a law such as the model law which would give the farmer the

information which he is apparently seeking through the operation of this law, but which would not at the same time destroy the valuable property rights of the fertilizer manufacturers.

If one inspector followed another, the second man would not know what the other man had done. I can conceive that by such punctilious administration it could be carried out, but cannot conceive of its being done practically. The model law can be administered readily through well-known methods of chemical control, but the same cannot be said of the new law now under discussion.

It is possible to enforce the new law. I suppose it would take the best time of three days to run a complete analysis of those materials if you went down to the completed analysis. I know that in the case of soil samples it takes from a few days to a few weeks to run them because of the complex analytical processes necessary. I imagine the expense would run at least $4.00 or $5.00 and probably more to complete each analysis. This would have to be done as to each material in each fertilizer factory in South Carolina, and with respect to each lot in each factory.

Unless the Open Formula statute means an analysis of every material, then there was no need to put the word [fol. 118] "analysis" in the statute, because the guaranteed analysis of the major plant foods is already required to be shown.

I feel that the question of enforceability has been given undue prominence in this case. The point we are making is that, without advantage to the farmer, our property is to be taken away without what we regard as due process, because we have invested very largely therein, particularly in research, demonstration, and advertising.

[fol. 119] Narrative of Testimony of Witnesses for Defendants

Testimony of R. W. Hamilton, a Witness for the Defendants

R. W. Hamilton, a witness for the defendants, having been first duly sworn, testified as follows on direct examination:

I am originally from Union County. In respect to my educational and professional training, will state that I was

born and raised on the farm in Union County, attended the schools in that County and then went to North Carolina State College at Raleigh, N. C., and studied an agricultural course, finishing in that in 1916. I went back to the farm until April, 1917, when I went in the Army. I got out of the Army in 1919 and went back to the farm and continued farming in Union County until July, 1922, when I was employed by Clemson College in the Extension Service as Extension Agronomist; and since that time my position with Clemson College has been as agronomist dealing with and giving information to the farmers of South Carolina on soils, fertilizers, crops and other matters relating to field crops. During the time I have been with Clemson I have had various titles, but my work has continued to be practically the same.

For one year I was Acting Chief of the Agronomy Division in charge of agronomic extension work, agronomic research work and agronomic teaching. For another year I was Acting Assistant Director of the Extension, being assistant to Dr. W. W. Long, in charge of part of the administrative duties as well as field work in agronomy. For the last three years beginning 1934 I have been Assistant to the Director of Extension charged with certain administrative duties. I also continued to have charge of the agronomy work of the Extension Service and have been State Administrative Officer for the National Agricultural Adjustment Administration in South Carolina.

In my work with Clemson College for the some 13 years it has continuously at all times been with the farmers even while I was in charge of the teaching in agronomy division at Clemson. I was also in the field on extension work. [fol. 120] Under the National Smith-Lever law under which extension service was inaugurated throughout the United States in 1914, it specified that the purpose of the extension service was disseminating to farmers, useful and pertinent information and facts on agriculture. That is primarily the law under which we work.

It is necessary for a man in the extension service to be very thoroughly acquainted with all research along the agricultural lines. It is necessary for us not only to keep up with our own state experimental results, but with the results of the United States Department of Agriculture and with other experimental stations, because the Smith-Lever law specified and the purpose of that was to carry to the farm-

ers the facts which were determined by the research and experimental stations which were established by states and by the Federal Government a considerable time ahead of the Smith-Lever law; and these experimental stations accomplished this gaining of agricultural information but had no means of carrying that information to the farmers. For that purpose the Smith-Lever law was enacted.

Now, my work, that has been continuously with the farmers, and one of the greatest problems that we have and the subject which I have had to give more information on to the farmers in South Carolina is fertilizer. We have in South Carolina 165,000 farmers—I don't mean rural population, but 165,000 farms or farmers which include sharecroppers, tenants, wage hands and the land owners. Almost without exception every one of those farmers, his living and his welfare is affected by fertilizer because every one of them that grows any cash crop uses fertilizer with the exception, I will admit, in the time of depression when they don't have money to buy fertilizer. If it went up, in case they choose to do without it, they do without it because they cannot pay for it.

Every farmer uses fertilizer to some extent. It vitally affects their living because it affects their crop from which they get their cash return and the crop from which they feed the crops they grow, so-called fertilizer, and I some- [fol. 121] times think that unfortunately it is true.

Fertilizer in South Carolina is of vital importance to every farmer. I have continuously said that in my meetings with farmers and very frequently up until the last two springs we have had each spring anywhere from 40 to 70 or 80 farmers' meetings, discussing nothing but fertilizer. Those meetings would be attended by anywhere from 100, 300 to 700, 800, or 1,000. I have always stressed the fact that we have put too much dependence in fertilizer and to show means of producing our living by some of the more fundamental principles of crop production like the use of horse manure and animal manure, then using fertilizer as a supplement to the sound fundamental principle of soil fertility. Now, in my experience with farmers personally, sometimes I feel like I know every farmer in South Carolina. Of course, that is not true, but I have probably visited so many of them that I feel like almost every time you call a farmer's name that I can place him. I feel that I have become acquainted with the farmers in South Carolina and

know their thoughts and know their desires; and I hope I know what is good for them, and I must admit that I believe that, though that is a little egotistical, but I have that much confidence.

Now these farmers, as I said, are vitally interested in fertilizer. Every one of them pays out money or signs a note for fertilizer in the spring. It has been one of my duties in those meetings to take the information, the chemical research summation and the description of chemical reactions.

Dr. Hazen here yesterday gave a very weighty dissertation on the chemical reaction of fertilizer. Now, of course, a farmer could not understand that. A farmer is a very intelligent human being, far more than he is given credit for being, as I will bring out later on, but a farmer has not been trained in chemical terms. It is my duty as a member of the extension service to put the findings of the research mentioned, the chemical principles and put them in ordinary words a farmer can understand and endeavor to get him to put into practice in his fields those things that would [fol. 122] be of benefit to him. I might use an illustration to show just how easy it is to interpret sometimes all of those chemical reactions and give to the farmer that part which affects him in words that he can understand.

Now, there has not been so much mention during the testimony about acidity of soil. Now it is true, admitted by all authorities, that certain materials increase acidity of the soil. That acidity can increase to a point where crop production will be seriously limited or on certain crops prohibit them from growing.

It is not sufficient, explaining to a farmer all of the chemical reactions that take place in the soil, and not explaining to him what does happen to it or explaining to him what needs to be corrected. It is a very homely illustration, but when I want to illustrate to a farmer I say this to him—"Don't you sometimes eat too much fried meat and say you have an acid stomach?" He says, "Yes". I say, "What do you do? Do you take a little dose of soda that sweetens your stomach?" Then I say, "When your stomach is acid you cannot digest your food". He says, "Yes, I have indigestion". Then I tell him that is the same thing with his crop; that certain plants can stand more than others. He has the feeling that crop plants cannot stand too much acidity. When soil gets beyond a certain point

they cannot adjust the food you put in the soil for those plants and they have indigestion, and all that is necessary to correct that is to give them a special mixture, put in a little lime—a little calcium—so these very complex and scientific reactions can be explained to a farmer in very simple words. If the Court please, I would like to read a quotation from one of the old authorities on agriculture. He was one of the men who developed some of the fundamental principles of agricultural chemistry which we are still trying to elaborate on.

(Reads:)

"Perfect agriculture is the true foundation of all trade and industry—it is the foundation of the riches of states. But a rational system of agriculture cannot be formed with- [fol. 123] out the application of scientific principles; for such a system must be based on an exact acquaintance with the means of nutrition of vegetables and with the influence of soils and the action of manure upon them".

Justus von Liebig—1840.

In those days he used the word "vegetables" to include all plants; "Manure" meaning all chemicals that were being used at that time. Now it means an exact knowledge. I want to stress that fact, that even in those days they realized that farmers must have exact information of those substances which were influencing their crops.

Now that has been the principle that extension service is following in giving the farmers, trying to teach them the proper efficient and economical use of fertilizer, giving them exact knowledge as far as possible to do so. Now, I would like with the Court's permission to read a little further from this bulletin and the circular which I wrote in 1930 and published in the Department of the South Carolina Extension Service, a government publication. Two reasons which I would like to read—I did not know until after the affidavit yesterday of Mr. Thurman—he had quoted some figures from this bulletin. One of the reasons I would like to read this is to tell where those figures came from as they were explained yesterday. Reading from the bulletin referred to:

"South Carolina is one of the oldest and largest users of commercial fertilizer. It ranks third in the United States in tonnage used, being exceeded only by North Carolina and Georgia. The annual tonnage bought by South Carolina

farmers is 750,000 to 800,000 tons costing 20 to 25 million dollars. This tonnage is approximately one-eighth of all the fertilizer used in the United States and the money value is approximately one-fourth to one-third of the value of the South Carolina cotton crop."

Now the publication of the United States Department of Agriculture published in 1931 in a survey of the fertilizer industry shows that the farmers of South Carolina for every [fol. 124] $100.00 worth of crop value they produced in the years included in this, for every $100.00 they produced they spent $18.22 for fertilizer, out of every $100.00 worth of agricultural value. That is the highest expense per $100.00 crop value of any state in the United States exceeding Florida even where the main crops of Florida are truck crops which are highly fertilized. South Carolina exceeds that in the amount of money spent for fertilizer.

Continuing reading: "The buying and use of commercial fertilizer is, therefore, one of the major economic problems facing the South Carolina farmer. Each individual farmer must solve this problem to his greatest economic advantage before South Carolina agriculture will have its just share of agricultural prosperity".

"The spending annually of 20 or more million dollars for one item of crop production should be done only with a thorough understanding of every factor that affects the economical buying and efficient use of material. There are three fundamental factors that must be given careful and intelligent study if farmers are to receive the maximum return for money invested in fertilizers".

Now that is the desire of all manufacturers of fertilizers, salesmen of fertilizer, and that of the public service which instructs the farmer in the use of fertilizer to get the maximum economical return from every dollar spent.

(Reads:)

"First and foremost of these factors is soil fertility as unrelated to commercial fertilizer. The second is the business method of financing fertilizer purchases. The third is the immediate and future effect upon plant growth and soil conditions of the many mineral and organic materials now being used as sources of plant food".

This is of vital importance to the farmers. Now, South Carolina experimental stations, since its establishment—which I believe was in early 1900—I don't know the exact

date, one of the first experiments it conducted was the effect of fertilizer on soils and crops in South Carolina. Those results were published. I have copies of those publications with me. The tests were laid out using so many hundred [fol. 125] pounds of acid, phosphate, analysis 16%, phosphoric acid, so many pounds of cottonseed meal, analyzing so many pounds of ammonia; so many pounds of nitrate, analyzing at that time approximately 18% of ammonia; so many pounds of kainit, analyzing so much; so many pounds of muriate of potash, analyzing so much. That was the principle on which these experiments were laid out—but the man laying them out knew the exact number of pounds of material he was putting on the ground, knew the analysis as far as the fertilizer content of the fertilizer was concerned. When these results were published they were published that way. That same principle has been followed by all experimental stations in the United States, even by the Department of Agriculture. When they wish to conduct an experiment showing the effect of fertilizer or fertilizer materials on plant growth, they use so many pounds of that particular material, analyzing so much. If they want to find the effect of a mixture, they do not go into the open market and buy 8-4-4 fertilizer; they make their own 8-4-4 fertilizer using a known number of pounds of acid, phosphate or whatever material they got phosphorus from; the known number of pounds of cottonseed meal or other source of organic, the known number of pounds of mineral nitrogen, etc., and the known number of pounds of potash. They publish that, their results, stating that they got those results from those fertilizers.

Now, in my carrying this information of the research branch of the State and fertilizer industry to the South Carolina farmers, I necessarily have to follow up charts and by chart and description tell them the results obtained by the fertilizers and what they might expect by using a similar fertilizer. Well, the question that the farmer always raises—he says, "You are showing me results of an experiment in which you use so many pounds of acid, phosphate, so many of nitrate, so many of ammonia, so many of potash, etc., but I cannot get a fertilizer on the market in which I know I am getting those number of pounds of acid phosphate, nitrate of soda, cottonseed meal, etc.".

[fol. 126] Judge Glenn: In talking with farmers, you have reference to particular types of soil?

A. Absolutely, you have to.

Judge Glenn: Your experimental stations—one is in the sandhills and some other land?

A. That is correct. You have to adapt your fertilizer that you use to the soil on which you are going to use it, and to the crop you are growing. Now my only answer to the question as to how I, as a farmer, could get particular fertilizer, my only answer in the past as I started to say, with all fairness to the fertilizer manufacturers, I think the vast majority of them put out an absolutely sound fertilizer, but as was stated on the stand yesterday there are certain ones of them that may wish to take advantage of a farmer, and in a particular analysis substituting something of the same analysis, but of a lower cost and lower effect on the farm—I have answered that question of the farmer as to how he was going to obtain this particular fertilizer this way—I said, "Well, in buying mixed fertilizer, if you can buy mixed fertilizer, buy it from a manufacturer in whose reputation for honesty and integrity for putting out an honest mixture in accordance with what he says is in it, you have faith, you buy from him, or if you do not believe that there is any such manufacturer as that, your only recourse then is to buy the separate materials, 16% acid phosphate, cottonseed meal, use that as a source of organic ammonia, buy sulphate of ammonia, get manure salts and potash, take a shovel and mix those materials together and you know exactly how many pounds of each one of those sources of materials you are using. You know it is a good source. Now, our farmers, every one of them, even the most ignorant ones—even the most ignorant farmer—is acquainted with acid, 16% acid. When you say acid he knows what you are talking about. He is acquainted with cottonseed meal and knows it is a good fertilizer. He is acquainted with nitrate of soda. I believe that has been used in South Carolina since about 1850 or 1860, the first imported in South Carolina. They know by past experience they will get results from [fol. 127] nitrate of soda. It has been a hard proposition to get our farmers familiar with and to use sulphate of ammonia, which is a cheaper source of ammonia. I will bring out partly why it has been hard to get him to use sulphate of ammonia—he is familiar with this—he is familiar with kainit, familiar with muriate of potash, and when he puts those materials in his soil he is satisfied that he has a

good fertilizer there. Then if his crop is a failure he says he had too much rain, dry weather or too many boll weevils, this, that, or the other, and never blames it on the fact that he did not work it enough—that is out of the question; he always works it sufficiently, and he knows it was not due to the fertilizer. On the other hand, when he buys a mixed fertilizer and which he merely gets information about analysis on the tag, as a crop farmer, he would blame it on one of two things. If he did not get a stand and he bought the seed he will swear the man sold him rotten seed—that is his first point. The second point is, if he did not get a good crop, he will swear the fertilizer ruined him. That is invariably true and I think the manufacturers present will even bear that statement out.

Going back just a little, to show the effect and importance of the farmer knowing those sources——

Judge Glenn: Before you leave that how important has been the use of kainit on the type of soil known as "Black Jack"?

A. I will take that up right now. On the "Black Jack" land of Chester and York Counties running into Newberry and Fairfield Counties, the farmers there found out long before experimental stations or research found out that they had to use more potash than they did on the red spots of a farm in the red hills, than Anderson County would have to use. They found out they had to. They did not know why but they found from personal experience that they had to use more potash to get good cotton maturity. That was a problem.

Judge Glenn: They were doing that before Clemson College was ever established, were they not?

A. Yes. They used that potash and got good results and [fol. 128] did not know why. That it had been within the time I have been at Clemson that we have on the "Black Jack" soil in Chester County in cooperation with the farmers of that County, laid out experiments to determine the amount of potash necessary, and why it was necessary to use additional potash on those soils. And the reason for that was the "Black Jack" soil is formed from high limestone rock. Where you have high lime content of the soil,

it makes the potash either more soluble and leaches out or makes it unavailable to the plant. That is the point that scientists argue. But from the farmer's standpoint, where you use lime, you have to increase the use of potash.

Similar to that and along the same line is cotton rust, which is a reddening of the leaves of the cotton, curling up around the edges, falling off of the leaves of cotton prematurely, and opening of the bolls prematurely, and is a condition that farmers recognized long before scientists did. I have had farmers argue with me within the last ten years that kainit was a far better source of potash to prevent rust than muriate of potash. There was no experimental data to back that up. I would argue the pounds of potash needed—I was wrong and have told them that.

Scientists have discovered now that the old German kainit which was mined and imported as raw salt, carried not only potash but carried magnesia.

There are more than two kinds of rust; the common kind is caused by lack of potash and the second most common is caused by lack of magnesia. When you use German kainit it prevents both kinds of rust and the farmers were absolutely correct in stating that German kainit was a better potash to use to prevent rust than muriate of potash. Now, we recommend that source of magnesia be used where considerable cotton is raised. I might mention that many fundamental principles in agriculture were not discovered by scientists but by farmers themselves. The causes and the wherefore and the chemical reaction were later worked out by scientists but the cure of the trouble had been worked out by practical farmers.

[fol. 129] Take for instance—it was mentioned here yesterday, I believe, something about the use of manganese sulphate to prevent certain types of plant malnutrition. It is only within the last four years that manganese sulphate has been recognized as having any importance in plant nutrition. That was not discovered by scientists, but discovered by tomato growers on the Everglade soil in Florida. They drained this soil, planted tomatoes and for one or two years got bountiful crops. The subsequent three or four years they could not even get tomato plants to live; they were using a high amount of fertilizer but could not get them to live. They found however that where they put in a handful of ordinary stable manure to a hill of tomatoes that the tomatoes grew just as well as ever. They did not

know why the manure did that, but they had a problem there and solved it by the use of manure. The scientists came along and said—"Why did that manure cure those" —and found out it was due to the manganese content. Then in order to supply that manganese for ready use—of course they have been manufacturing manganese sulphate for many years but not using it in agriculture—but now it has become common as an amendment to fertilizer. Another means of supplying it is old basic slag, which has been used by various fertilizer manufacturers for years, coming from the steel mills in Alabama, which contains phosphorus, some manganese, considerable magnesia and calcium, fine soil amendment.

Now each one of the fertilizer sources—I will put it this way—when we speak of analysis of a fertilizer, we mean the percentage of phosphoric acid, the percentage of ammonia or nitrate and the percentage of potash that fertilizer contains. When we speak of formula it means how many pounds of material were used in that fertilizer to carry those pounds of plant food, how many pounds were sources to that. There is a distinction between formula and analysis.

Now the various sources of phosphoric acid, the common ones, 16% acid phosphate—it may be 18% or 20%, and old acid count which was discussed yesterday.

[fol. 130] Then we have raw rock phosphate in its various forms, which is untreated rock, then basic slag, then triple superphosphate, which formation is a more highly concentrated form than the other source. The different sources of phosphorus leaving out basic slag and raw rock phosphate, to take acid phosphate 16, 18, or 20 and your triple superphosphate, in making a comparative test in plants to see the effect of those different sources, you find very little difference. It makes very little difference where phosphoric acid comes from except from certain manufacturers.

Now with tobacco, it has been found that too much sulphur applied to that tobacco affects the burning quality, harms that quality, and reddens the leaf when curing. So you don't want too much sulphur.

Sixteen per cent acid phosphate, standard mixtures, is composed of phosphorus in the various forms, mono-calcium, di-calcium, tri-calcium phosphate, and anywhere from 30 to 40 pounds of calcium-sulphate or gypsum, which is

a combination of sulphur with lime. That affects tobacco and you want to know it. But if you have a tag on which so many pounds of 16% acid phosphate is stated, the standard analysis or amount of sulphur in 16% is readily available. You don't have to make a particular analysis to determine that. It is about standard. With potash there is material difference in the effect, the source the potash has on the various crops, particularly with the more highly fertilized crops and those crops which have a high perishable market value, a short crop season like truck crops, tomatoes, potatoes, tobacco, etc.

The fertilizer material in one—take muriate of potash—it not only carries actual potash but it carries chlorine in a chloride form. When you put that in your soil you get effects from the potash and you also get effects from that chloride put in the soil. That chloride put there may be helpful or it may be harmful, it depends on the content [fol. 131] in the soil as to its supply and to the plant that you are growing there and to the amount of rain-fall and how you put that fertilizer in.

In growing Irish potatoes, for instance, it has been found it is not the best idea to get all of your potash from muriate of potash, because you may get such a concentration of chloride there that you will either injure the germination of the seed itself or actually get such concentration that you will prevent proper growth of that plant.

There are experiments published which show if you have too much chlorine in potato fertilizer you produce potatoes whose quality is low, more soggy when cooked. That is a point of argument with scientists that certain experiments show that.

Now, with sulphate of potash, you apply potash but you also put sulphur there. With sulphate-potash-magnesia, when you put that in the soil you supply potash, magnesia and also sulphur.

In kainit, you put potash and considerable chlorine or chloride and various other chemicals that may be in that crude salt. Each chemical that you add to the soil has an effect on that soil. The soil is a most complex medium, I would almost say the most complex medium with which the human race has to deal, but after all these years of experimental work with soil, the scientists admit they have only scraped the surface, speaking literally and figuratively, in finding out the physical and chemical and biological reac-

tion which took place in the soil. Each chemical substance in fertilizer, as a minor element, each substance added to the soil affects that soil physically, chemically and perhaps biologically. The effect on the soil affects the plant and that in turn affects the product of that plant and what that farmer may produce from that soil.

Now, with nitrogen, when we come to that source of plant food, that is the most important plant food to the [fol. 132] Southern farmers from the standpoint of effect on crops, from the standpoint of cost and from the standpoint of effect on his soil. There are almost an unlimited number of sources of nitrogen. I don't mean they all are commonly used in fertilizer, but a large number are used in fertilizer and has — returns. The nitrogen group as a whole is divided up into mineral nitrogen and organic nitrogen. The mineral nitrogens are divided roughly into those nitrogen materials which furnish material in nitrate form such as nitrate of soda and those materials which furnish it in ammonia form such as sulphate of ammonia.

Now, take those two—it is important for a farmer to know from which source his mineral nitrogen or water soluble nitrogen is derived, whether from nitrate of soda or sulphate of ammonia. The nitrate of soda carries nitrogen and also sodium. Now the effect of sodium when you put that in the soil is to produce an alkaline condition which may or may not be of advantage to that particular crop, may do harm in certain cases.

The sulphate of ammonia has nitrogen in ammonium form and the remainder left there is sulphur, which in its process of change in soil produces an acid condition. That acid condition may be harmful or helpful, dependent on the crop growing there. This is an illustration—spinach is a truck crop. It is a crop that cannot stand acid in the soil. It has to have a high lime soil. Irish potatoes is a crop that grows best on the soil that is acid. Now the chief reason potatoes do best on the acid soil, which is the main consideration, is that if you plant potatoes on the soil that is above a certain degree of acidity, that is, as you could do, you get less acid; you will have potato scab which is a disease. Now that micro-organism bacterium or scab will not live and develop or harm potatoes in acid soil. Potato scab is prevented by keeping that soil in a slight acid condition. In South Carolina, it is quite a common practice to grow spinach and potatoes in the same land. You have a bal-

ance there to keep in that soil, balance between high acidity [fol. 133] and high alkalinity in order to get spinach to grow and even with potatoes and get them to do their best. The farmer, in order to keep that balance—I will admit it takes a highly intelligent farmer to do it, but our truck growers not only in South Carolina, but through the United States, if they continue to be truck growers, they have to be almost scientists themselves or at least have a workable knowledge of science—comes to pathologists because their problems are so concentrated and intensive, due to the crops they grow. We have farmers in our State growing spinach putting just enough calcium and enough fertilizer that is basic, carrying bases, to give enough alkalinity in the soil to produce the best spinach crop and by the time they bring that field back into potatoes the rainfall will have bleached out the calcium and reduced it to enough acid to allow potatoes to grow without scab; and the potatoes are fertilized with a high percentage of the nitrogen which will produce acidity rather than alkalinity. So that shows the importance of the practical farmer knowing from what source that plant food is obtained.

When it comes to the organic materials carrying nitrogen, they are myriad in number. During the testimony yesterday one of the men stated that the fertilizer industry was a scavenger. I would like to object to the use of the term scavenger. From the standpoint of a farmer and fertilizer interest to the farmer, I would prefer that the term scavenger be not applied to the industry.

Organic nitrogen except cyanamid and urea is obtained from living materials; and there are many organic materials that are used as bi-products or by a certain chemical or heat treatment. These organic sources may be conditioned to where they may be used as sources of nitrogen. These organic materials, some of them, may contain a small percentage, fractional percentage of one to two or three per cent of water soluble ammonia or nitrogen which would be in the same form as nitrogen of soda, or sulphate of [fol. 134] ammonia. That will only be source to the plant as that material is worked on by bacteria in the soil under proper moisture and heat conditions and has rotted. Now, the length of decay, or period of decay, of various organic materials varies some, such as blood, decays very readily and furnishes almost immediate available form of ammonia

and on down to some of the rather crude organics which you put in the ground one or two years before they completely decay. As an illustration of the content use animal stable manure. I am sure every one agrees that an application of stable manure which furnishes nitrogen in the organic form can be seen for longer than one year. Experiments show that the effect of a sufficient amount of manure may be shown in a crop for three years after application. That shows that the rate of decay varies. The availability of the material used is that source of organic ammonia.

The ordinary stable manure has other plant food in it. Where it is kept under proper condition, not allowed to leach, heat or ferment, it will contain ammonia, some phosphorus and the amount will depend largely upon the feed that the animal eats, and the same way with potash; and in addition to that it contains all sorts of organic chemicals of various kinds and sorts.

The availability of all these different forms of nitrogen material, as I stated, is not the same. If the Court please, I would like to quote here from a series of bulletins published by the Massachusetts Experimental Station, Inspector of Commercial Fertilizer, published by H. D. Haskins and Walker, about experiments about a Massachusetts station for four years, 1926, 1927, 1928 and 1929. This Massachusetts Experimental Station, as far as my knowledge goes, has done the most in intensive and extensive and complete research on the availability of the various sources of organic ammonia I know of anywhere in the United States. Now this bulletin quotes the result of the experiments by years. In the bulletin of the South Carolina Extension Service of 1930, there is furnished an average of a four years result [fol. 135] and quoted from the Massachusetts Bulletin. Now, the results which I quote were obtained from them. These are organic sources of ammonia and were washed with water—I forget how many times—but the regular chemical procedure, to get out the water soluble ammonia; and that left in that material only the true organic form of ammonia which would be available by decay. And these tests were made not only by chemical methods but were conducted in pot experiments using plants to corroborate and coordinate the chemical result.

Here is the relative standing in the availability of nitrogen furnished by those various carriers of organic nitrogen.

For the sake of this comparison the chemists took dried blood at the availability of 80, which is an arbitrary figure but chemically accepted.

(Reads:)

EXHIBIT

"Table 4.—Average Relative Nitrogen Availability of Various Organic Carriers of Nitrogen

(Basis: Dried blood at 80: Dry matter yield; Numeral in parentheses (3) indicates number years in experiment.)

Material		Ave.
Dried blood	(3)	80.0
Omega tankage	(3)	48.7
Nitrolene	(3)	43.1
Nitrogenous tankage	(3)	45.9
Process tankage	(3)	52.4
Milorganite	(3)	74.2
Agrinite	(3)	63.4
Available tankage	(3)	45.3
Hynite tankage	(4)	53.6
Peruvian guano	(2)	94.5
Whale group	(2)	70.7
Dry ground fish	(1)	74.4
Cottonseed meal	(1)	70.4
[fol. 136] Castor bean meal	(1)	77.5
Packing house tankage	(1)	79.1
Supernite	(2)	70.3
Smirow tankage	(1)	54.8
Garbage tankage	(1)	41.6
Rape seed meal	(1)	64.3
Darlings tankage	(2)	60.0

As suggested by Judge Parker I will file this Bulletin containing this table as exhibit (which was done).

Here is the point—in this test the availability of the various sources of nitrogen vary from 80, which was blood, down to 43.1 availability of the nitrogen in one of the particular materials. So there is all that nitrogen content in the same chemical form but from the standpoint of effect on the plant it had to become available, and that shows the difference in availability. As to the technical soundness and the scientific soundness of the experiment, I accept the reputation

of the chemists and of the Massachuestts Experimental Station that they conducted that experiment by accepted routine and approved chemical methods. So, the effects of these food plants and these carriers of the plant foods, are of vital importance to the farmer. It is information to them, information they want.

Now, it was mentioned that the placement of fertilizer has a larger effect on crop production than the sources of that fertilizer material or sources of the plant food that was there. The placement of the fertilizer does have considerable effect on the plant. Now that fact was not discovered by scientists; that was discovered by farmers, that the placement of fertilizer affected the stand of the crop, therefore the production and it affected the growth of the crop. They determined that from personal observation. In distributing fertilizer under cotton, something will stop up the spout of the fertilizer distributor or the chain will drop off and you don't discover it for three or four rows.

[fol. 137] The practice of side dressing in South Carolina goes back practically 20 to 25 years, and is within our recollection. The farmers saw that where the fertilizer distributor did get stopped up, in the same field side by side they got the best stand of cotton on the row where no fertilizer was; for the first week or two that cotton grew off faster; of course, from there on the other cotton beat it. Another way they found that out, in a lot of communities, especially in Union County, we had some farmers that we called ignorant farmers who would not rip up the old stalks or prepare the land for cotton until just before planting time and then go in the middle of the old cotton row, run a furrow, no fertilizer, put it up with two more furrows and plant without any fertilizer. They always got a better stand than the man next to them who was a highly intelligent farmer using an economically sufficient amount of fertilizer. That was discovered by farmers. Now, the research agency —there was the farmer who knew that was a fact but did not know what chemical thing was taking place; so the experts or experimental stations worked it out. To go back a little, the farmer's solution of that was this—that when he put down fertilizer instead of leaving it in the row as it came from the distributor that when he ran the harrow that mixed that fertilizer with the soil, it diluted with that soil, that the chemical concentration was not right under the

seed to the point where it would affect germination and root growth.

The research stations in cooperation with the United States Department of Agriculture and the Fertilizer Association laid out experiments which determined just where to put that fertilizer to get the best results. In fact, I might say when I was Acting Chief of the Agronomy Division at Clemson in 1926 I outlined one of the first experiments on the placement of fertilizer conducted in South Carolina; and they found by those experiments that it was best to put the fertilizer in bands slightly away from the seed and below the seed.

The relation between placement and the Open Formula is this—the point was made that the placement of the fertilizer was of a greater effect on the plant than the source [fol. 138] of the nitrate of potash or phosphorus. It has just another valuation like the other things we have—the way the crop was worked, the fertility of the soil or the kind of weather you have. I would not say it is of greater effect than the ammonia. That is the point I want to make. I am familiar with the Open Formula Act to a certain extent. I necessarily in my work—not that I am a lawyer or have anything to do with the administration of the enforcement of it—but in order to answer questions farmers ask me, I have to have a working knowledge of the fertilizer laws.

In my opinion that act from an agronomic standpoint would be beneficial to the farmer because he would know just the things I have attempted to bring out in the discussion heretofore, that he should know those sources of plant food which he is buying and putting in the soil because they have such vital effect on his welfare. The act would be of considerable benefit not only in cotton, but especially in tobacco because while the quantity of cotton produced is of vital importance the quality of cotton is limited by breeding of the plant rather than by fertilizer. But in tobacco you sell your tobacco and its value is based largely on the quality of the leaf produced; and the kinds and amounts of fertilizer and the sources of each of the plant food elements going into tobacco, finish fertilizer controls the quality of that leaf for its production in the fall when you have it cured.

I am sure no manufacturer would ever intentionally put anything there to harm it, but fertilizer companies, like all

of us—some are more thoroughly trained, have more technical and scientific training than others—some might, in buying their materials, buy on price alone and obtain some materials and mix it in the fertilizer that would not produce the best quality of tobacco unintentionally.

The source of the potash used in tobacco fertilizer is of great importance in that if you give that tobacco plant too much chlorine it makes tremendous growth. You can in- [fol. 139] crease your tonnage, but it makes leaf, thick and hard to cure, leaf that may go all to pieces in the packing house; that may not be exactly accurate from the chemical standpoint, but that comparison shows how too much chloride may be harmful. On the other hand, in the tobacco fertilizer you ought to have 2% chlorine in order to prevent certain physiological condition of the leaf caused by lack of chlorine, injurious effect on the leaf. There would be many ways if a man started out to manufacture a fertilizer that would injure tobacco. He could do it in many ways, but as I said I don't think anyone would intentionally start out to manufacture fertilizer that would injure; but unintentionally and uninformed a person might obtain all of his—I say might—all of his nitrogen from sulphate of ammonia, for instance. While with that source—it is not probable but I say he might—and with that source of ammonia alone under your tobacco your quality of the leaf would be very inferior. On the other hand, you might put all cottonseed as your source of ammonia and the chances are your tonnage of leaf produced per acre in that case would be very small, unprofitable. It is the use of proper balance between these different sources of plant food—that is where you obtain your NRA tonnage and quality in tobacco and other crops. This tendency could be eliminated if a farmer knew just exactly the source of each element he put under his crop, provided the farmer knew the effect of each one. Now that has been—that is the type the Extension Agricultural leading experts throughout the United States have undertaken to enable the farmers; to teach the farmers the effect of these different sources so that he will know when he uses them what he might expect and under what condition to use them and what methods to use if he obtains the maximum results.

In 150 or 160 high schools they teach them all of the primary principles of plant food, soil, etc., and it is really

a pre-college course in agriculture, using the bulletins of the U. S. Department of Agriculture and other sources of in- [fol. 140] formation.

The Government has just recently made soil surveys of most of the farms in South Carolina. There was conducted what was known as land uses survey and they obtained soil materials from approximately 87,000 farms in South Carolina, which is something over one-half of the farms listed by the census, and they determined the acidity or alkalinity of those soils or, as you might put it, the degree of acid.

I would not go so far as to say that with that knowledge the farmer could readily know what amount the farmer should use on a particular crop on a particular field. Personally, I think entirely too much emphasis has been placed on the question of acidity or alkalinity of the soil.

It is useful to a farmer to know the degree of acidity in his soil, but it is not the sole factor on which the use of fertilizer should be based. It would be very beneficial to know just what this plant food is coming from.

When a farmer asks me to visit his farm and advise him in the amounts and kind of fertilizer he should use, I first study of course his soil. One of the factors I want to know about that soil is whether it is acid or alkaline or what degree? I want to know the soil type, its previous fertilizer history and many other facts, but the PH is one of the important factors I want to know.

Under the old law, the farmer did not know the number of pounds of 16% superphosphate in that fertilizer if there were more than one source of phosphoric acid listed on the tag. Now, if it is listed "Source of phosphoric 16% acid, phosphorus" it is easy to determine; but if it is listed on the tag "Phosphoric acid obtained from 16% acid phosphate and amophos", manifestly you could not tell what material was used, only how many pounds of those two sources used.

The same way with nitrate. If it was listed, "Available water insoluble ammonia" and it lists a number of sources, you could not tell the number of pounds of each source used.

I cannot state definitely that a fertilizer manufacturer had any way of knowing with any degree of certainty the kind of fertilizer to apply on a particular type of soil to [fol. 141] produce a particular crop growth because I do not know all of the sources of information that the fer-

tilizer manufacture-s have. If a manufacturer was making up an 8-3-3 fertilizer to sell over the entire state of South Carolina, for instance, he would not know whether that 8-3-3 fertilizer was going to be used on that "Black Jack" lands of Chester, the poor red hills of Union, or the sand-hills of Kershaw counties.

By "analysis" in respect to fertilizer it means the percentage of phosphoric acid, the percentage of ammonia or nitrogen, and the percentage of potash in 100 pounds of mixture. There are three elements in 8-4-4 fertilizer, phosphoric acid, ammonia and potash.

In answer to Judge Glenn's question I would say that it is not only the accepted usage, but it is the definite definition of "analysis" that it means breaking down material into the fundamental chemical elements.

In order that there may be uniform procedure and uniform definitions the Committee on Definitions of Terms, etc., anyway it is the Association of the Fertilizer Analysis Chemists, that is, State Officials, as adopted by the American Fertilizer Association sets up the definition of "analysis" as follows:

"The word analysis as applied to fertilizer, shall designate the percentage composition of the product expressed in terms of nitrogen or ammonia, phosphoric acid and potash in their various forms".

If I may refer to the South Carolina law, Section 2, it refers there to analysis of the fertilizer and states this among other things—I will not read it all.

(Reads:)

"and the minimum percentage only guaranteed to be present of available phosphoric acid, of nitrogen (ammonia equivalent), and of potash soluble in water. The items shall be printed on the package in the following order:

Weight of Each Package.
Brand Name or Trade Mark.
Guaranteed Analysis."

[fol. 142] Now under that subhead:

"Available Phosphoric ..... per cent.
Ammonia Equivalent of Nitrogen ..... per cent.
Potash soluble in Water ..... per cent."

The section referred to is Section 6366 of the Code of Laws of South Carolina, 1932.

Judge Watkins: The Court will take Judicial notice of the fertilizer law without formal introduction.

Applying the term "analysis" to the different ammonia elements I understand it to mean this: In buying cottonseed meal, it is the standard trade practice to buy 7% or 8% meal. Farmers, and I am sure the entire trade understands that 7% meal means it contains 7% ammonia, and the 8% meal contains 8% ammonia. It is true that cottonseed meal has some phosphoric acid and some potash, but that analysis of phosphoric acid and potash is never mentioned unless in making a mixture and working out a formula you are taking some of the phosphoric acid or potash carried by cottonseed meal or unless you are selling it that way.

Take nitrate of soda, the farmers, dealers, manufacturers, and government officials, and all men dealing in agriculture speak of 18% soda or 19%, whatever it may be, meaning it is nitrate with 18% of ammonia. They don't understand about the percentage of sodium, boron, iodine or anything. The thing he is buying the ammonia for is the ammonia content and that is the accepted usage throughout the country.

As to the effect of boron on crops and soils, I really would prefer not to go into the effect of boron on crops and soils because you can get into an argument or any side you want to take on that and the conclusions are very different except this—I might mention that the farmers determined that too much boron was detrimental before scientists discovered it. The farmers in Barnwell, Bamberg and Aiken Counties in 1919 or 1920 discovered that. It was called to the attention of the agricultural officials after the farmers had seen by the use of potash material containing borax or boron [fol. 143] they injured their crops. Now those suits were in Court for a considerable time on the effect of boron. As to its beneficial effect and how it is beneficial to the farmers, I hate to make any statement because scientists cannot agree.

As to whether a farmer should know the amount of boron he is getting, I think it is absolutely immaterial. Under the South Carolina law we now have the clause which states, "No injurious material shall be used in fertilizer".

In respect to rare or minor elements, of necessity I have had to do a lot of studying on those things. I might refer

to this bulletin which was compiled by Dr. L. G. Willis, Soil Chemist, at the North Carolina Experimental Station, Raleigh, N. C. In this publication I think he has given abstracts and references of all work done not only in America, but Europe, Australia, Africa, and everywhere else of the effect of minor elements on crop production. Now I will admit I have not studied all of those things. Being ignorant on all technology and scientific chemistry of those things, I cannot summarize what Dr. Willis has said, but from a practical matter of getting information to the farmer, if a farmer writes me and says, "I have something wrong with my cotton crop"—I had a letter to that effect the other day from a farmer in Orangeburg County—he said, "Come down here quick", and he meant come quick. He said, "The leaves are all shedding off".

On examination—I did not go myself, could not go—but a man from Clemson College went and brought cotton stalks back and I discussed the matter with him—from the examination of the appearance of the leaf, it had premature reddening of the leaf all over. A little later on all the leaves turned red but at this particular stage of growth of a plant they should not have been reddening. If the reddening had begun right around the margin of the leaf and that had broken down and curled up, that would have meant potash deficiency; but this was red and uniform, that scientists determine is magnesia deficiency. It is not necessary [fol. 144] to tell the farmer about the minor plant foods on his crop. We will tell him to use two or three hundred pounds of dolomitic limestone in his mixture that will satisfy the minor element. Now this is a personal experience of one of the most extensive growers in Beaufort County, South Carolina, about five years ago; in fact before anything was published on the subject. He had about 50 acres of cabbage, cutting and selling it, getting a tremendous price at that time. He figured at that time that he had $80,000.00 worth of cabbage at that price and on 4 acres of that he did not have a single head that was marketable. It was absolutely unheading; the rest was heading and he was shipping. He says, "Tell me what is wrong". I am no truck grower, experimentor, or anything like that and was not supposed to know anything about truck crops; but I am supposed to know about soils and fertilizer and I said, "I will see what I can find out". He said, "It

needs some lime". I said, "I don't know". I had with me a field outfit which will determine the degree of acidity in particular limits. I ran the soil test and found the field was alkaline. I said you have too much lime here now. He said, "You do know something"; he said, "I just put 30 tons of oyster shell on that last fall, which was all out of proportion". I said, "The chances you have a potash deficiency, and it is certain the more lime you use the more potash you must use and you may have something else deficient". This was before a lot of publication on rare and minor elements. I said, "It is a theory now"—it was in a stage of theory then—"that a high lime content without manganese becomes unavailable to the plant—have you a little manganese available?" He put it down and even at that late stage they headed out. Now that man did not have to be told about minor elements. He knew that if he had land on which he had lime extensively he had better get 40 or 50 pounds of manganese sulphate, or soluble form of magnesia.

Cyanamid is a source of ammonia, synthetic source of [fol. 145] ammonia. The United States largely manufacture- it at Niagara Falls by the Cyanamid Company. It has been one of the most accepted forms of fertilizer that has ever been sold in the United States, indisputably. Cyanamid is a good and splendid form of ammonia, splendid form to obtain nitrogen when you know you are obtaining it in that form and understand how to use it. When you understand that, you may buy ammonia in the cyanamid which is a cheaper form, and get good results. But if a farmer obtains it in fertilizer and does not know it or if he buys it separately and uses it as he would other common material he would kill his crop. Cyanamid is a very complex organic form of nitrogen. Before a plant uses it it has to break down in the nitrogen form. In process of breaking down from cyanamid to urea form there is toxicity of the roots. Then it breaks down to urea and then to nitrate form. In the breakdown of cyanamid to urea, this has powerful toxic effect on plant roots, so powerful that I know of one peach orchard in South Carolina where the Cyanamid Company itself put out four acres demonstrating the use of cyanamid on peach orchards, put it out improperly to them, using their own trees, and every peach tree on the four acres died within two years. On the other hand

where cyanamid is used properly, put down a sufficient time ahead of planting to permit that chemical break down to take place in the soil, moisture and rain to wash out the toxin, it makes a splendid fertilizer. From the standpoint of mixed fertilizer, it is one of the best mixtures known because in piling the mixture up the cyanamid, a very active form, sets up chemical reaction, reduces the heat, and drys out the pile.

I have no intention of treading on the manufacturers' territory because I am not familiar with the manufacturing end of fertilizer; I have never been in one, but I know that they now in their use of cyanamid use up to 30, 40, or 50 pounds per ton in their mixing pile to get the chemical heating reaction to dry it out. That use is all right. The bad reputa- [fol. 146] tion cyanamid got, and has not out-lived, was due to the fact that when cyanamid was originally put on the market, maunfacturers—some of them—due to the fact that it was one of the cheapest forms of ammonia, attempted to obtain all of the ammonia that was productive from the standard cheap form of ammonia also classed as organic form. Chemically it is organic form; in the field it is mineral form as far as the effect on the plant. Manufacturers like to use it for this second reason. If you put too much cyanamid in using that, run the distributor down the row and put a cotton planter upon it, it kills the plant; and they had an awful time overcoming that reputation which cyanamid got by its improper use.

To some extent the Open Formula is attributable to the use of cyanamid; to some extent it is attributable to the acidity of the soil created by certain fertilizer sources; and to the effect of certain potash-sources on tobacco and truck crops; to the effect of the use of low available nitrogen organic carriers on the production.

We have a little bulletin sent out on fertilizer mixing, which is applicable to home mixing of fertilizer, not commercialized mixing.

There is no limit to the formulas that could be compiled. Speaking from my own standpoint and not the manufacturers'—I believe I could take 16% acid phosphate, nitrate of soda, sulphate of ammonia, cottonseed meal, a little fish scrap, and one or two of blood, muriate of potash, sulphate of potash and a little dolomitic limestone, adding a little

manganese sulphate, and I think this would cover the whole territory of what would be desirable in the fertilizer for a particular known soil and crop. Those to be varied according to the crop and soil.

I have had no experience with the "Rainbow" and "Wildcat" brands.

Answering Judge Glenn's question whether some new fertilizer has recently been put on the market that they get to mix in fertilizer that makes the other things more avail- [fol. 147] able, I will state that there may be a slight foundation, in fact, but in practice no material difference, because you might say that manganese is a catalytic to make the plant take up plant food or potash is the chemical that stimulates the plant to take the others up, but there is no secret unknown substance they are putting in their fertilizer that will do that. I am familiar with home mixing of fertilizer. In mixing lots of 10, 100 or 5,000 tons you have to know the quantity of material you put in, if you mix 1,000 tons you have to know the exact number of pounds of each source you put in for the amount that you would mix up.

Judge Parker: Here is what I want to get your reaction to—I understand this is one of the points they make—they say that in the fertilizer business a man naturally operates on a large scale, that he mixes up about 5,000 tons at a time, that in mixing that they use elements or constituents of different analyses—for instance 7% cottonseed meal and 8% cottonseed meal; they say when they go to sack them up in 200 lb. sacks that they would have no trouble in saying the content of cottonseed meal or in saying whether the cottonseed meal was 7% or 8%, even if that was all the analysis they were required to give.

A. I see no difficulty in that, that is from the standpoint of determining it. As to their factory routine in setting up that I cannot testify; but from the standpoint of formulating and calculating the number or pounds of cottonseed meal and its average per cent and the number of pounds, I see no difficulty. I could do it.

Q. Tell me why you see no difficulty.

A. Well, take cottonseed meal for instance—you had 7% and 8% meal in there. You know the total number of pounds of material that went into that pile; you know the total number of pounds of ammonia carried by that material.

Judge Glenn: On each particular sack, the best you could do physically would be to give the average?

A. Yes.

[fol. 148] Q. If the only construction of the statute would be that they would have to make an absolutely accurate statement on each sack, then you by that testimony practically admit that it is impossible, do you not?

A. It would be an average.

Q. The average is the only reasonable way that they could honestly make a statement?

A. Yes. You would have the total number of pounds of cottonseed meal that went into that pile, the total number of pounds of ammonia carried by that cottonseed meal; if you divide the total number of pounds of ammonia by the total number of pounds of material, you would get the percentage of ammonia that come from that.

Judge Parker: That would be true if you mixed the entire pile in one mixing?

A. Yes.

Q. But if you use 7% meal in one end of the pile and 8% in the other end of the pile, that would not be true would it?

A. I am not familiar with the manufacturing end of fertilizer,—but this is my understanding of how it is done, the mechanics of it. In making up these mixtures there are so many pounds of this and that material piled and dumped from the top; naturally it dumps in cone shape and it stretches out; and after it goes through chemical reaction and gets hard, the whole pile is cut down and run through a course of machinery and thoroughly mixed and, in reality in the pile itself, it would be an average.

From the agronomic, or crop production standpoint, I am speaking of the effect on the farmer. It would be sufficient for the farmer to know that in a ton there is 200 pounds of cottonseed meal, 7% or 8% or somewhere between those figures. Then in a sack there would be one-tenth of that or 20 pounds of cottonseed meal.

I had nothing to do with the passage of this Open Formula amendment except that Mr. Geraty, Mr. D. B. Anderson and others consulted me from time to time about such a law.

[fol. 149] Cross-examination.

I do not know whether the Chief Chemist at Clemson and the Dean of the School of Agriculture and Director of the

South Carolina Experiment Station are in favor of the Open Formula Amendment or not. They are not here. I represent Clemson at this hearing. At one time and now I recommend the home-mixing of fertilizer. The extent of home-mixing depends upon the price of a mixed fertilizer as compared to the price of the materials. Hundreds and thousands mix their own fertilizer regardless of the price situation. They can still do that without the open formula, and any one who desires a particular mixture can obtain it from the manufacturer.

In South Carolina there are a large number of dry mixing plants doing a tremendous and increasing business.

It cannot be said unqualifiedly that ammonia is ammonia; pure nitrogen is in gas form, but in the gas form nitrogen is nitrogen, wherever it may be, but nitrogen in the form we use in agriculture may be in any number of forms. Nor can it be said without qualification that the plant uses nitrogen in only one form, because experiments recently have shown otherwise.

I am not a lawyer and cannot interpret this Open Formula law.

Under the commonly accepted use of the term "analysis" you would not have to include any but the three major plant foods.

Various publications are available to farmers which show the analysis of standard fertilizer materials, and these show the percentages present of chlorine, magnesium, and calcium; on the average this is sufficient.

The farmer is now told under the law before the amendment the sources of his nitrogen (ammonia), but he cannot tell how many pounds of a listed source are used. Availability is a relative term determined by chemical methods [fol. 150] and may or may not be more available as determined by the plant in the field.

The particular mixture which I suggested would not be the best if there should be too much rain.

Different soils require different fertilizer mixtures and even different fields on the same farm, and so different poundages of the materials, but I don't mean a difference of one or two pounds.

Farmers learn much by experience; some have tried nitrate of soda as a source of ammonia, and on light soil, sandy soil like we have in this State, continuous or heavy rains eat that nitrate of soda out, so that the farmer finds

by experience he would get no beneficial results from nitrogen put in that soil, due to such excess of moisture; thereupon, he applies the ammonia in several forms, using some cottonseed meal or tankage or fish scrap, some organic form of nitrogen. Different soils require different fertilizer mixtures; illustrating on light sandy soil on which it is desired to use a fertilizer having 4% ammonia in it I would probably get 3% of that ammonia from some organic source with 1% from the mineral or readily available sources. On the other hand, if the land was heavy clay, where the leaching is small, mineral ammonia being cheaper, I would reverse that, using 3% ammonia from the mineral form to 1% in the organic form.

Under the Open Formula law the manufacturer would determine the number of brands and the different analyses they offer; this being determined by the manufacturer and not the farmer. It is true that the manufacturers will be influenced by the farmers' demands. The Open Formula does not require the manufacturer to make any particular form of fertilizer. The manufacturer prepares his own fertilizer and selects a name, like "Rainbow" and the farmer must select which brand he desires. If one manufacturer does not have what he wants, he goes to another manufacturer. At present the farmer chooses manufacturers based on analysis, and not upon contents of material.

The Clemson College authorities encourage the use of [fol. 151] the selection of the pounds of plant foods, use of the plant food, and the materials that will produce the best crop of that particular crop on a particular soil on which it is going to be used.

While it would give more trouble under the Open Formula plan, yet we would be glad to do that as what I want the farmer to know is exactly what he is suing. I am not familiar with similar laws in other States.

Trade names sometimes play a part upon persuading farmers to buy fertilizers. A farmer may buy a particular trade name this year and having bad results never buy it again. I cannot speak with any authority as to the fertilizer laws of other States. I do not know of any other State, which has an Open Formula law.

There is no law now which requires a manufacturer to make up good with any particular poundage of materials. I don't think it is sufficient to state merely the class in which nitrogen occurs, but it would be a help.

Many other variable factors in addition to fertilizer enter into the production of a crop. It would be hard to list them. Even without this Open Formula law there is no reason why, in South Carolina, any farmer cannot get his fertilizer mixed just like he wants it.

Redirect examination.

There is nothing in the Open Formula which would prevent the manufacturer from putting any substance in the fertilizer, but the Open Formula law is proposed to require a statement of what is put in the fertilizer mixed.

[fol. 152] Testimony of John W. Geraty, a Witness for the Defendants

JOHN W. GERATY, a witness for the defendants, having been first duly sworn, testified as follows on direct examination:

I am from John's Island, Charleston County; am a farmer, engaged in truck farming; I operate a general farm, but specialize in truck farming and vegetable planting. I have planted truck crops from 300 to 2700 acres every year for the past 44 years. I plant cabbage, potatoes, beets, beans, lettuce, cucumbers—just a line of general trucking. I have made a study of fertilizer and the effect of the different fertilizers on my crops. I am a practical farmer, not having much education. When I first started in this truck crops my first experience was 46 years ago when I was 14. My father grew the first vegetables ever grown in South Carolina for shipment from the state in the year 1866 and from that time up to the present William C. Geraty, first, and now William C. Geraty Company, have continuously been one of the largest operators in the state and over 40 years of that period we were the largest individual growers of vegetables in the southeastern states. When I was a child my father did a great deal of experimenting; and he had already found that on vegetable crops results produced varied from year to year tremendously and that you would have that variation in yields and crop failures when there was no reason that he could see that you should have them on account of the weather condition, qualifications or anything of that kind, and it got to the

point, he told me about 1880 that he was getting large areas of his land that were absolutely becoming dead, stuff would not grow, although it was well fertilized with these commercial fertilizers; and he finally came to the conclusion that his trouble was something *was* in the fertilizer that he was using on the crops that was causing the trouble and not in the season or qualification. So he started to making those experiments and made them every year with different kinds of fertilizer materials.

[fol. 153] As I said, 46 years ago I had to take over that burden; 44 years ago I took it over entirely and have continued ever since. In this experimenting, he found that certain types of fertilizer materials that were being used by fertilizer manufacturers—in some way he found what they were using in those mixtures—so he got to the point where he would buy those different materials that he knew were being put in the fertilizers and then he would make his field tests with those same materials. Now at that time they were using in fertilizer in South Carolina large quantities of leather meal, which, according to chemical analysis, showed a very high percentage of organic nitrogen; but when he would take leather meal and make a field test of that and put it down on the crop he found that he got absolutely no results from it but as a result it simply got the soil in such condition that even when he used stable manure or proper kinds of fertilizer for the next two or three years he could not get any results from those.

Of course, he was no chemist. He started to work when 13, but he just experimented and got to making inquiries, had tests made and found there was something in that stuff that destroyed—he got some chemists to work on it—and their opinion was that there was some property in that leather meal that killed or destroyed all soil bacteria in the soil; and if you do not have that soil bacteria, as I understand it, the only way any organic ammonia is available for plant food is to be broken down—or whatever the term is—and nitrified by soil bacteria in the soil. I think it is an ordinary matter of toxin and excretions from the bacteria. When he got to reasoning that out, he says that is the very thing. He says you go to work and tan leather and the object is to preserve it. He says the very materials you put in that material to tan it is to kill bacteria. You know you can take a piece of harness leather, put it in manure, and let it stay there for years and it will not rot, simply

because the material put in there will kill and destroy bacteria and that leather cannot rot until the bacteria is out. That is what we were doing. As a result of getting that [fol. 154] knowledge, we took that up with the proper authorities and got a regulation passed in South Carolina—I have worked on the Open Formula myself for 28 years—so we got a regulation which prohibited the use of that material. Then we found that the fertilizer people claimed, that is, the fertilizer chemists, claimed that certain groups or types of fertilizer material, and I am referring to organic nitrogen materials, high priced materials, that are practically of the same value and give the same results for the percentage of nitrogen or ammonia that they contain; and therefore it is immaterial whether—for instance if you have three or four of the materials put together—immaterial as far as the farmer is concerned, which of those particular materials they use in mixing their fertilizers, and of course they are guided in mixing fertilizers by price. Now that is what the chemists say, but our actual farm tests over years do not say that. When we took the same materials which chemists say give the same results and we put under our crop side by side for several years in the same patch or field we find that the yield results and quantity produced vary and vary considerably.

The quantity of the carrier and the chemical content that comes from that particular carrier—for instance, you take a high grade of ground fish which is one of the best fertilizer materials. Take cottonseed meal and a high grade packing house tankage—now each of those materials, according to what fertilizer chemists and Clemson College chemists tell us, that those materials for the percentage of nitrogen they contain of ammonia, give practically the same results and therefore immaterial if making a fertilizer when you had those three materials listed whether you gave ⅔ from one or ¾ from the other; but when you take those materials and go into the field and actually grow crops, using the same quantities, the quality and quantity of the stuff is not the same and is of sufficient difference to make a difference in profit and loss in the growing of the crops.

[fol. 155] Now, to show you—I have heard a lot of talk about the value of the secret formulas or trade-mark formulas. Now those formulas in themselves, while it is not intended to be, they really work a very grave injustice on the average farmer, I mean the small farmer that is not

sufficiently intelligent to think things out right, tenant farmers, for instance. If I go to work and buy a bottle of castor oil, glycerine or anything that is supposed to be a formula, that trade-mark implies in itself that every bottle of that material is identical, that I am getting the same material. Now, every one of the fertilizer gentlemen will have to tell you that is so—as far as all of the research work and value, it is true that they have spent money for research and tests, but there has been such a change in price and the uses of various ingredients, higher prices, particularly the organic ammoniates that go into fertilizer that you would not recognize them. You take fertilizer put up 15 years ago, when we used what we call 50-50 material, 50% nitrogen coming from organic source, and 50% from mineral source—in fact at that time all the better class of truck farmers used 60-40 with 40% nitrogen coming from mineral source and 60% from organic source. Now the change and difference in the market price of a lot of the best organic materials have been such that they are prohibitive; we cannot afford to use them and therefore materials of fertilizer factors use today to put up secret formulas would not be recognized if compared with material they used 10 or 15 years ago. You would not know it was the same thing.

Now, you take a farmer buying on that trade-mark—I buy what mixed fertilizer I buy not on trade-mark, but on confidence I have in the man selling me his goods for his honesty and integrity; that is all I can do. But now if a farmer buys one of the trade-mark formulas—and by that I mean one of their made formulas—this year and he makes an excellent crop, naturally next year he will be predisposed to buy exactly that same brand of fertilizer. If he buys that same brand of fertilizer he has every right to feel and [fol. 156] I believe that he is getting in that fertilizer exactly the same material that he got the preceding year. It is just a logical conclusion and deduction. In the meantime, they have changed that; the materials and quantity that went into it this year may be entirely different from that of last year and as the success of his crop is entirely dependent upon the source from which those materials—he does not know it either year—but a man might make a crop failure and lose his crop; in that way I don't think it is treating the farmer exactly fair because he has bought that stuff thinking he was getting exactly what he bought

the year before; now the value of the trade-mark I heard those people talking about $200,000 to $250,000, I don't think that touches the value of them to the fertilizer people. Those things are worth millions of dollars under the present law, but the whole value consists in being able to put in fertilizer materials that the farmer cannot check on and don't know about and then through the sales talk sell these fertilizers and a lot of men are lead to believe they are made up principally from those high-grade materials which Clemson College and our County Agents and Extension Services from their tests have shown us are the best to use. A farmer today does not have to be able to read and write.

As far as my line of business is concerned in truck farming, I don't think there is any state in the union today that I do not go into in my regular business; in my garden business I am contacting growers of vegetable plants for the wholesale seed trade of the United States and Canada and almost every year I cover a territory making my contracts with large catalog seed houses; and I travel every state east of the Mississippi River and nearly all of the states north of the river, and of course these vegetable plants I grow are sold in growing vegetable sections; and therefore I am in close touch with all the crops of the east of the Rocky Mountains.

There is not in any of these states that I know today where there has been so intensive and such good work done [fol. 157] informing us as to what we should use and the best materials as has been done by Clemson Extension Service; and they are giving that information to the farmer. I will say a very large majority of farmers—even negro tenants—the county agents going to them, have this knowledge available and today under the present fertilizer law it is simply lost. We absolutely cannot make use of it unless we go into the market and buy our materials and mix our fertilizers. I don't need that law for my own protection. I mix thousands of tons of fertilizer. I don't need the law to protect me because I can protect myself, but the small man that buys the sack or ton, he is the man needing the protection and he is not protected today and he cannot farm intelligently, economically and make use of the information available to him and furnish to him buying under the secret formulas as they put it up today.

Now to give you a very concrete illustration—nothing secret about formulas—any farmer of any intelligence

knows as much about fertilizers and the results—we know more about results than the manufacturers, but we don't know the economical end of the case. That is the reason the law is being fought, not because it cannot be enforced or complied with.

From my experience there would be no difficulty in showing on the sack the content of the material in pounds.

I visited quite a few of the larger fertilizer plants. There is one thing I want to clear up, this pile business; the two ends of the pile. That does not hold water. If you go into any of the large fertilizer plants, if you are buying these fertilizer materials and buying regular standard materials, the stuff is first of all raw materials and they usually come in car load lots, carried in all the fertilizer plants—I mix a lot myself and know what I am talking about—a lot of the fertilizer plants make up what we call base mixtures.

In South Carolina you have a big demand for 8-3-3 or 8-4-4 and our truck fertilizers demand 7-5-5 or 7-6-6 and 7-8-5. Now those demands are normal. You get approxi-
[fol. 158] mately the same demand every year for the same percentage. So in anticipation, filling these orders for the different lots of fertilizers, they make up base mixtures of 8-3-3, another of 8-4-4, another of 7-5-5 and into these piles you weigh all materials; now as these materials are weighed out, go into the plant, run through mixers, hauled up and dumped on the pile; first starts at the bottom—of course the big houses keep on dumping—to keep that pile uniform.

You were speaking about cottonseed meal. Now take blood, for instance. No two car loads are the same. Cottonseed meal is pretty uniform, but blood is not. If they go in today with a car load of one grade, then tomorrow or two or three days afterwards a car load of a different grade, they simply have to vary the quantity that they put in that pile to keep their analyses uniform. That stuff is hauled up, dumped on the pile, runs down on the pile on the side and it sets up, is as hard as cement sometimes; after it goes through a curing process. If it runs on this side (illustrating) and on this side and the other end too, the layers are not so much on the length of the pile but layers on layers of the material as they run down over the cone, just as if you were taking a funnel and pouring through it.

After the stuff is set up and they get ready to re-grind and sack it, it has to go through a curing process, you cut

that pile and regrind it. Well, the variation, because they are using practically the same materials—there is practically no variation—just a slight variation. Suppose you have a total of 100 tons of blood going into that pile. Now you may have had 20 different analyses of that blood—I don't know the amount of ammonia—but when you get through if you put into the pile 100 pounds of blood and you have so many pounds of ammonia, you divide one into the other and you have certain ammonia from blood and that is what that average is. Nothing complicated or hard about that.

I have been in plants and have it in my own mixing machines. We analyzed that proposition. I have been in some large plants, but have never seen long piles. All that I saw [fol. 159] were cone shaped piles. I don't say there are no long ones, but even if that is the case the difference is so slight to keep that variation so far as the protection of the farmer is concerned, it would be infinitesimal to know the analysis of that sack.

If the manufacturers would put the average of the pile on the sack it would be substantially complying with the Open Formula Act.

I was chairman of the farm end appointed by the Governor. There has been a good deal of talk about the committee. I want to show you what it means. One of our biggest expenses is harvesting a crop and picking of our vegetables, but when you arrive at the harvesting, that is not where the investment comes in—we don't have to raise money but we have to finance, get money to buy seed, get money to buy fertilizer for the crops.

So, when it comes to the financial investment of a farmer, our industry is bankrupt. We have got to finance this crop, and the cost of the fertilizer in my average crops represents over 60% of the total investment cost of growing that crop up to the harvesting point; and the only one of my crops that is expensive is Irish potatoes because of the cost of the seed potatoes; and even as to potatoes, fertilizer represents 40% of the cost production up to the harvest. I will get through the potato proposition. I start mixing fertilizer—I did not buy any in 1916—I buy from Coe Mortimer before the AA bought it. I went to him with my problem. He was really not only a business man, but about the age of my father and a real friend of mine. He sold me materials and for years and years I bought thousands of tons of materials

and mixed fertilizers for myself and for my neighbors and friends. That was 44 years ago. That is a good long time. On the potato crop we made certain tests and we found that certain fertilizer materials would produce the best results on potatoes. We gave that information to Clemson College and did whatever we could to cooperate with them, and through E. H. Rawls, who is truck crop specialist for Clemson under the Extension Service, they ran certain tests making up a regular standard 7-5-5 potato fertilizer from [fol. 160] the ingredients that are all common every-day fertilizer materials; and then as a result of that—I think in 1932 or 1933,—he ran crop tests in Charleston and Beaufort Counties; and in those two Counties we grow 82% of the potatoes in South Carolina; my recollection is, and that was made of record in a hearing in Columbia—my recollection is there were 27 of those actual field tests run in cooperation with farmers, we using this 7-5-5 formula that was put out by Clemson College from actual crop results, and we found it to be the best materials for growing a crop of potatoes and over all of the larger standard fertilizers; he made those tests against their special plot formulas furnished us for growing potato crops under formulas where they spent this vast amount and gave us its results, out of the 27 tests. That year it happened potatoes were very low in price, so low that we could not sell the number two potatoes, but at the time of digging potatoes those grown from Clemson formulas produced 40% more of United States No. 1 crop potatoes than potato crops grown from special potato formulas furnished us and from which those tests were made. Even at the low price, the price of the potatoes at 40% less was more than sufficient to pay the fertilizer bill and we had that year around 12,000 acres in potatoes. Now, practically every one of those men, when you would go to them and ask about their potato formulas and show him your Clemson formula would say "Ours is practically the same thing".

Your Honor referring again to the necessity of a farmer knowing the various materials that go into his fertilizer, according to the Open Formula, we will take as an illustration our experience this past season in our lettuce crops. Lettuce crop is one of the most expensive that we grow, the only thing that I know that costs more being celery; and in lettuce we use anywhere from 2½ to 3 tons of high grade fertilizer per acre on lettuce. Through our experience with

and cooperation with Clemson College we have worked out and found a class of fertilizer materials that are best suited [fol. 161] and the proportions to raise satisfactory lettuce. Now the big trouble that we have had in loss in lettuce in the last few years has been due to trouble that we call tip burn or slime. The common expression is slime. If you are eating a head of lettuce may be you will find a little brown edge and if you get that in your mouth, it will simply destroy your meal. We did not know at first whether that was a disease or what was the trouble but when that developed, and it develops just about the time the lettuce is headed and ready for market, it is 100% loss. You cannot ship it. We have found that with certain formulas we can grow lettuce under favorable conditions without this trouble developing; when it is fertilized with certain mixture of fertilizer, then we don't have that trouble. This year, for instance, in our territory ut 60% of our lettuce crop was a total loss due to . levelopment of tip burn or slime. Now, crops that were not affected by it were the crops that were grown with our home mixed fertilizers, mixed up in accordance with those formulas that were developed for us by cooperation with Clemson. We cannot say and prove that those losses were due to the other fertilizers but it is a coincidence that where Clemson formulas — used and we knew what was in them we produced good crops, and the losses were on crops that were produced by the others. Some of those produced with the regular commercial fertilizer were just as good as those we grew but the losses were in crops with mixed fertilizer where the farmer did not know the ingredients in the fertilizer.

I don't know of a single case where a crop was lost where he used the special lettuce formula that had certain things in it. It is a reasonable deduction that there must have been something in that fertilizer that caused that, however, there is no way of proving it. But when you take a lettuce crop that costs you anywhere from $110.00 to $125.00 an acre to bring it up to the stage of harvesting, and when you wipe that out on a farm- he is gone. His very exist- [fol. 162] ence is dependent on his having this accurate knowledge of the ingredients of that fertilizer and the percentage of the plant food in this. When I say percentage of plant food, I mean percentage of phosphoric acid, am-

monia or nitrogen, and potash, and in all these fertilizers where they are referring to it, the farmers are not speaking about the minor elements and those things. The whole thing is in reference to the nitrogen, phosphoric acid and potash.

To show you that is happening to us again, going to the point of tankage—it is really a crime to permit any fertilizer company just to use the general term tankage and put those ingredients in fertilizer without knowing what those tankages are. Now getting to the human side, tankage in fertilizer would be about what we call hash in our food. It can be excellent, it can be good, or it can give you ptomaine poison. A good grade of tankage is an excellent fertilizer, but when all kinds of stuff go into tankage, as they read that list this morning, you may get this tankage from not only one of no value whatever but from those which are actually injurious.

I happen to know of one case. Years ago we had a regulation passed by the Fertilizer Board of the leather meal proposition, not permitting leather meal to be used in South Carolina.

I am of a rather inquisitive turn of mind and in making contracts once, I was in Wisconsin. I had never been in a large shoe factory. I wanted to see how it was done. I noticed all of the leather scraps and I said, "What are you doing with those leather scraps?" The man said, "We are selling that to the fertilizer people". Well, as soon as I heard that I became interested right away. Now those leather scraps from that shoe factory were being sold in Wisconsin to this concern making tankage and of course they used other material too, slaughter house stuff but they were putting in that tankage ground up leather meal.

[fol. 163] Of course, under the present chemical analysis, as I understand it from the Clemson people and other people, they analyze that leather meal to show a very high grade of ammonia and nitrogen, but as a matter of fact it was not only worthless but the sources themselves worthless because the materials, the bacteria destroying materials in that stuff, when it went into your soil not only prevented nitrogen becoming available but destroying bacteria in the soil and prevented nitrogen from other sources becoming available because there is not enough bacteria to nitrify them. I happened to find out that same factory was ship-

ping to Savannah and this state that tankage which was listed as high grade ammoniate tankage to be used by our fertilizer manufacturers. There is no way a fertilizer man can know that leather scrap was in that tankage, and I don't know any way of the analysis showing that; but there it was coming here, gentlemen. That stuff could absolutely have destroyed a man's crop.

Now, to come back to this matter of cyanamid that you were discussing. As Mr. Hamilton explained, cyanamid is all right and any intelligent farmer can use cyanamid and use it to advantage provided he knows he is using it, but under certain conditions if cyanamid is put in stuff and he does not know it is there, his crop can be absolutely destroyed. You take with us in our vegetable crops, we plant our seeds and if we don't get a stand with the first planting of the seed, a difference in time is material; a week or ten days, where we depend upon markets, means financial loss or profit because one week beans may be worth $1.75 a bushel and a week later not worth 50¢ a bushel.

Now, twenty-one years ago I assisted in forming the South Carolina Produce Association, which is a farmers' corporation that has been acknowledged by the Department of Agriculture as one of the best organizations developed in the United States. We have had it 21 years. Now, realiz- [fol. 164] ing the necessity of our being able to produce these crops and take no chance on stuff not germinating, we bought and put in a seed germinator. So we asked all of our members to order their vegetable seed in time and in ample time to put in the germinator to see if the seed is OK, so that we would know it is OK when going into the ground. Three or four days between the time of maturity means profit and loss. We have had case after case in our section where this seed has been put through the new germinator, the seed was all right, the soil conditions right, proper amount of moisture and we would plant the seed; sometimes we would get a perfect stand, other times a total failure—no stand at all. Now, that is a case right there.

All of our small vegetable seeds are surface propositions and you don't have over a fourth to a half an inch of dirt on top; the fertilizer is there in large quantities. If cyanamid happens to have been put in that fertilizer and the farmer did not know it was there, he has no means of knowing it; on account of the bad repute that cyanamid is in, the fertilizer people don't like to say it is there, but it

goes to work and destroys the seed. That means the loss of a man's crop. He has to wait a week or ten days before he can make another planting and a loss of that work.

Under the present law the analysis given does not have to show cyanamid to be in the fertilizer. The manufacturer could give that as one of the sources, but I don't know whether he would have to give it or not.

At present the manufacturer has to give it, but not the amount used. The amount of cyanamid anywhere from 30, 40 or 50 pounds to a ton would not create this condition that would destroy that crop, but on account of cyanamid being one of the cheaper materials, cheaper broken down priced ammoniates, financially it is to the advantage of the fertilizer people to have this knowledge.

Because it is a cheaper source of nitrogen it is a tempta- [fol. 165] tion to put cyanamid in in larger percentages and, as the industry has acknowledged, there are some men in the industry that would do that. Now, that is the kind of information we want. There is another thing that developed in the last few years. They have gone to work—and this comes under the head of tankage. They are bringing into this country from Europe, as I understand, tankage made from sewerage, an organic tankage; and when you get to figuring values, it ought to be figured on the basis of the other standard organic tankage; but of course it is cheaper than blood, fish and that sort of stuff. Now when you just think of the matter of disinfectants, bichloride, formaldehyde and every other disinfectant that does go into sewerage, every one of those disinfectants being developed to the highest extent to destroy bacteria, and then you simply evaporate that stuff, grind it and put it in fertilizer; in making fertilizer tests, they don't make tests for all of the different poisons, and are not supposed to; they make tests for plant food, and as a result, that stuff should go free of charge. I would not use it—I might after several years' testing—but at the present time, I would not use it as a gift because the results there should be exactly the same as in leather meal, the whole object of the disinfectants going into the sewers being for the purpose of killing bacteria; and the more bacteria we have in the soil, the better the results. If you kill soil bacteria the soil is dead and you cannot get results from anything.

A farmer cannot farm intelligently or economically unless he actually knows what is going into the fertilizer and the sources of that material and the percentage of them. It is a physical impossibility. When you take that potato situation where even a year of low prices with the difference in the yield of potatoes, the crop was sufficient to pay the fertilizer. Taking the price potatoes sold at this year, that amounted to more than one million to the farmers in those counties this year.

[fol. 166] I referred to bacteria in the soils, and will say that my information and understanding in respect to what bacteria does in fertilizer, I have obtained from reading bulletins and from our chemist. My understanding of the bacteria is this—that the bacteria in the soil of those organic matters, cottonseed, fish and blood, in that state as they go into the soil, they are not available for plant food. The plant cannot take them up. According to my understanding the bacteria in the soil eats the stuff, sets up decay and that decay is carried by summation, you might say, and resecretes and that makes it available for vegetation to take up the plant food. That is the way I understand it; whether it is right or wrong, that is the way it has been explained to me, and therefore the more bacteria you have in your soil the better results you get from fertilizer and the more tons and pounds of fertilizer you can use profitably.

Referring to "analyses" of fertilizer, my understanding is that this refers to the several elements entering into the manufacture of fertilizer, such as phosphoric acid, potash, and nitrogen or ammonia, plant food. The word "analysis" as far as the farmer and manufacturer and trade are concerned, as far as the fertilizer chemists and experimental stations are concerned, means the amount of plant food in those three elements, phosphoric acid, ammonia and potash.

I was appointed by Governor Blackwood as one of the farmer members of the Committee to draft a fertilizer law. I attended all meetings of the Committee and all hearings before House and Senate agricultural committees. The farmer members said they knew nothing about law enforcement but they wanted the Open Formula Law. We were willing to concede anything else the fertilizer industry and Clemson representatives decided was good and enforceable and could reasonably be complied with. After more than a year and many meetings, we made or were supposed

to have made two reports and I made the minority report about this Open Formula, and as the law was finally ac-
[fol. 167] cepted I was in the minority. We succeeded in having this law held up. It came mighty near being passed, then the amendment was put in the next year and passed.

I have mixed fertilizer and know exactly how many pounds and the percentage of fertilizer elements of each material I put in, but after it is mixed there is no way of telling what was put in. I don't think it would cost more than a fraction of a cent a ton additional expense to comply with the open formula amendment.

In cross-examination.

I assisted in drawing the open formula amendment and I am responsible for any ambiguity in it for I had it drawn that way. I am not bitter against fertilizer companies; they are the best friends I have. I never had any litigation with any fertilizer company but the AA in my life. The Meridian Fertilizer Company brought suit against me but I did not even answer the complaint. I was unable to pay and they got judgment by default; there was no litigation. I have been sued several times by the V-C Company but the suits were not contested. It was just a matter of paying the accounts. These judgments still stand. If I buy the same brand of fertilizers this year I bought last year I would not have the same ammonia as I had last year. I do not need the open formula but I think it will be a good thing for me in general business. I use sufficient fertilizer to buy my materials and mix my own but with the open formula I might be able to buy better than I could mix myself. I understand the open formula amendment will permit Clemson to issue regulations that tankage will have to show the open formula, and that Clemson has issued regulations preventing the use of deleterious substances. If Clemson was making an analysis of tankage they would not test for deleterious substances unless tipped off about it. Knowing the number of pounds of each material would help me to find out if there was enough deleterious substances present
[fol. 168] for I could have Clemson determine the analysis and source of the tankage. I can do that now too, but if the number of pounds was given I could decide if there was enough bacteria destroying poisons there to be deleterious to my crop.

This would require an analysis of more than the phosphoric acid, ammonia, and potash but whenever we have requested Clemson College authorities to make those analyses for us they have always been glad to make them.

Approved this the 29th of January, 1937. Rock Hill, S. C.
J. Lyles Glenn, U. S. District Judge.

[fol. 169] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

AFFIDAVIT—Filed December 11, 1936

STATE OF SOUTH CAROLINA,
County of Darlington:

Personally appeared before me W. C. Dowling, who, being first duly sworn, says:

I am a citizen of South Carolina and have been farming for a good many years. I received my education in the local schools and the University of South Carolina.

In operation of my farm I have used many tons of mixed fertilizer made by different manufacturers, and in selecting my fertilizer I am only interested in the quality of the materials and the availability of the same and the integrity of the manufacturer. Under the present fertilizer law for South Carolina, the manufacturer is required to brand and tag his product as to availability of the ingredient and the amount of water-soluble, such as available phosphoric acid, amount of water-soluble ammonia, amount of insoluble ammonia and amount of water-soluble potash from both muriate and sulphate. Knowing these facts I am able to in-
[fol. 170] telligently purchase my fertilizers for the various crops that I grow and to know the pounds of each ingredient would be of no service to me, as it would only give me a formula that I could not mix as well as the manufacturer, who is equipped to do this. I, therefore, feel that the enactment of the 1936 amendment can be of no service to me

and will only tend to confuse me in the purchase of my fertilizers.

(Signed) W. C. Dowling.

Sworn to and subscribed before me this 7th day of August, 1936. (Signed) Fannie Sue Stevens, Notary Public for S. C. (L. S.) (Notarial Seal.)

[fol. 171] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

AFFIDAVIT—Filed December 11, 1936

STATE OF SOUTH CAROLINA,
County of Fairfield:

Personally appeared before me J. Roy Robinson, who, being first duly sworn, says:

That he is a citizen of South Carolina; that he was educated at Wofford College, Spartanburg, S. C.; that he has been for the past 12 years and is now engaged in business as a farmer in the county and State aforesaid; and that in said business he has had experience in growing cotton, corn and other crops.

That in growing such agricultural crops he has used many tons of mixed fertilizer made by different manufacturers.

That in selecting a particular fertilizer for purchase he is interested only in the quantity and quality of the plant food contained in the mixture. That he has been buying his fertilizers as guaranted under the present South Carolina fertilizer law, without the 1936 amendment, and obtaining from the branding on the bags and tags all the information that he needs to make his selection, because such branding [fol. 172] shows the amount of available phosphoric acid, the amount of water-soluble ammonia, the amount of available water-insoluble ammonia, and the amount of water-soluble potash and whether the potash comes from muriate of potash or from sulphate of potash. This in-

formation shows him that the phosphoric acid and potash are available to his plants and lets him select the kind of potash he desires since some crops respond better to one than to the other. The information as to ammonia lets him judge as to the relative times when the ammonia would become available since he knows that the water-soluble ammonia is quickly available and that the material furnishing water-insoluble ammonia must decompose in the soil before the ammonia can be used by his plants; he selects the proportion of each of these forms according to the crop for which it is intended. It would be of no advantage to him to know the number of pounds of each individual material used in the mixture because such additional information would not help him in the selection of a fertilizer for any given purpose.

(Signed) J. Roy Robinson.

Sworn to and subscribed before me this 7th day of August, A. D. 1936. (Signed) G. L. Harvin. (L. S.). (Notarial Seal.)

[fol. 173] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

AFFIDAVIT—Filed December 11, 1936

STATE OF SOUTH CAROLINA,
County of ——:

Personally appeared before me Kirby S. Tupper, who, being first duly sworn, says:

That he is a citizen of South Carolina; that he was educated at Clemson College; that he has been for the past 6 years and is now engaged in business as a farmer in the county and State aforesaid; and that in said business he has had experience in growing cotton, corn and other crops at Mulberry Plantation.

That in growing such agricultural crops he has used many tons of mixed fertilizer made by different manufacturers.

That in selecting a particular fertilizer for purchase he is interested only in the quantity and quality of the plant food contained in the mixture. That he has been buying his

fertilizers as guaranteed under the present South Carolina fertilizer law, without the 1936 amendment, and obtaining [fol. 174] from the branding on the bags and tags all the information that he needs to make his selection, because such branding shows the amount of available phosphoric acid, the amount of water-soluble ammonia, the amount of available water-insoluble ammonia, and the amount of water-soluble potash and whether the potash comes from muriate of potash or from sulphate of potash. This information shows him that the phosphoric acid and potash are available to his plants and lets him select the kind of potash he desires since some crops respond better to one than to the other. The information as to ammonia lets him judge as to the relative times when the ammonia would become available since he knows that the water-soluble ammonia is quickly available and that the material furnishing water-insoluble ammonia must decompose in the soil before the ammonia can be used by his plants; he selects the proportion of each of these forms according to the crop for which it is intended. It would be of no advantage to him to know the number of pounds of each individual material used in the mixture because such additional information would not help him in the selection of a fertilizer for any given purpose.

(Signed) Kirby S. Tupper.

Sworn to and subscribed before me this 8th day of August, A. D. 1936. (Signed) Wm. G. Major, Notary Public, S. C. (L. S.) (Notarial Seal.)

[fol. 175] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

AFFIDAVIT—Filed December 11, 1936

STATE OF SOUTH CAROLINA,
County of Fairfield:

Personally appeared before me U. G. DesPortes, who, being first duly sworn, says:

That he is a citizen of South Carolina; that he has been for the past 25 years and is now engaged in business as a farmer and merchant in the County and State aforesaid;

and that in said business he has had experience in growing cotton, corn, small grain.

That he attended Davidson College for one year and the University of South Carolina four years and since leaving college he has been a farmer and merchant and has bought, sold and used many tons of fertilizer.

That in selecting a particular fertilizer for purchase he is interested only in the quantity and quality of the plant food contained in the mixture. That he has been buying his fertilizer as guaranteed under the present South Carolina fertilizer law, without the 1936 amendment, and obtaining from the branding on the bags and tags all the information [fol. 176] that he needs to make his selection, because such branding shows the amount of available phosphoric acid, the amount of water-soluble ammonia, the amount of available water-insoluble ammonia, and the amount of water-soluble potash and whether the potash comes from muriate of potash or from sulphate of potash. This information shows him that the phosphoric acid and potash are available to his plants and lets him select the kind of potash he desires since some crops respond better to one than to the other. The information as to ammonia lets him judge as to the relative times when the ammonia would become available since he knows that the water-soluble ammonia is quickly available and that the material furnishing water-insoluble ammonia must decompose in the soil before the ammonia can be used by his plants; he selects the proportion of each of these forms according to the crop for which it is intended. It would be of no advantage to him to know the number of pounds of each individual material used in the mixture because such additional information would not help him in the selection of a fertilizer for any given purpose.

(Signed) U. G. DesPortes.

Sworn to and subscribed before me this 5th day of August, 1936. (Signed) W. W. Lewis, Clerk of Circuit Court, Fairfield County, S. C. (L. S.) (Seal.)

[fol. 177] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

AFFIDAVIT—Filed December 11, 1936

STATE OF SOUTH CAROLINA,
County of Richland:

Personally appeared before me A. Patterson, Jr., who being duly sworn, says:

That he is 58 years of age and was born and reared on a farm near Columbia, South Carolina; that he has farmed all his life raising cotton, corn and small grains principally.

That he attended the public schools of Richland county and Patrick Military Institute at Anderson, South Carolina.

That for 26 years he was County Supervisor for Richland County. That recently he was employed by the United States Government to purchase good farm land on which rehabilitation projects were to be operated.

Deponent further says that on his own farm and on other farms which he has operated during his life, he has used upwards of 1,000 tons of different kinds of fertilizer and has [fol. 178] observed the effects of different fertilizers on different crops for varying conditions of weather and soil.

Deponent believes, and so states, that the present South Carolina law prior to the 1936 amendment with reference to the branding of fertilizer on bags and tags gives a farmer all the information that he needs to select the best fertilizer for any particular crop; that in his opinion the requirements of the 1936 amendment that the number of pounds per hundred pounds of each plant food be shown would be of no benefit whatever to a farmer, and that the enforcement of the 1936 amendment might work a hardship on the farmer due to the probable increase in the cost of fertilizer and to the possibility that dishonest fertilizer mixers might defraud him.

Deponent further states that if the enforcement of the 1936 amendment should result in some of the high grade fertilizers now being sold in South Carolina being forced off the market that the inability to obtain such fertilizers would

be a distinct hardship on the agricultural interests of the State.

(Signed) A. Patterson, Jr.

Sworn to and subscribed before me this 7th day of August, A. D. 1936. (Signed) Mary G. Henagan, Notary Public for South Carolina. (L. S.) (Notarial Seal.)

[fol. 179] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

AFFIDAVIT—Filed December 11, 1936

STATE OF SOUTH CAROLINA,
County of Beaufort:

Personally appeared before me W. Brantley Harvey, who being first duly sworn says: That he has been a member of the South Carolina General Assembly for the past twelve years, the first four of which he served as a member of the House of Representatives, and the last eight of which he has served in the Senate, that for the past several years there has been introduced in the General Assembly in one or the other branches of the General Assembly a bill that was finally passed at the 1936 Session of the General Assembly and became what is commonly — as the "Open Formula Act"; and that as Senator from an agricultural County he has continuously worked for the passage of said Act.

Deponent further says that he is not a farmer and does not have personal knowledge of the necessity of the passage of such an Act, but that the showing made to him by the farmers, large and small, of this and adjoining Counties, convinces him that the farmers of South Carolina are entitled to know the source of the various plant foods contained in fertilizer. Beaufort County is primarily a truck producing County, and the growth of truck crops is a highly [fol. 180] developed art. Certain truck crops require for the successful growth thereof that the plant food in fertilizer be released and made available to the plant at a specific stage of development in the plant. If, for instance, ammonia is desired at a certain stage of development in the

plant the liberation of ammonia either at an earlier or a later time may actually be detrimental to the proper development of the plant. There are various sources of ammonia used in fertilizer, some of which, I am informed, are readily soluble, and the ammonia quickly made available for plant use, and other sources of ammonia, which give equally high chemical test, are almost insoluble, and is extremely late in being available as plant food. What is true of ammonia is more or less true of other elements of the fertilizer.

Deponent further says that six or eight years ago, when this matter was first called to his attention, practically all of the farmers of Beaufort County bought stock fertilizer, but that the failure of the General Assembly to pass this Bill caused a great number of farmers to buy the ingredients and mix their own fertilizer so as to be sure of having the proper sources of plant food for the specific crop for which that fertilizer is to be used. I am informed that a different type of fertilizer is needed for different types of crops, and that to successfully produce truck crops a man should have actual knowledge of the soil requirements, his plant requirements, and the sources and amount of plant foods in the fertilizer that he uses. In Beaufort County today a vast majority of the fertilizer used is mixed in Beaufort County or ordered upon special order. The farmers prefer to purchase their fertilizer from the regular fertilizer companies because the large companies are able to thoroughly mix the ingredients, but they do not feel that they can afford to buy fertilizer without knowing exactly the amounts and sources of all ingredients of plant foods therein.

[fol. 181] Deponent further states that in South Carolina we have an Extension Service that is able to tell the farmers exactly what plant foods his land requires to successfully produce any given crop, and that if this valuable information is to be of real service to the people of South Carolina it is imperative that the farmer know when he purchases a sack of fertilizer if he is getting plant food that will be available to meet the deficiencies of his soil.

Deponent further says that he has talked to hundreds of farmers of this and adjoining Counties, and that he has yet to find a single farmer who is not of the opinion that he can more intelligently farm when he has the full knowledge of

not only the chemical analysis of his fertilizer but the sources of the plant food.

W. Brantley Harvey.

Sworn to before me this 10 day of August, 1936. T. H. Seabrook, Notary Public for S. C. (L. S.)

[fol. 182] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

AFFIDAVIT—Filed December 11, 1936

Personally came before me H. F. King and on oath said:

That he has farmed the greater part of his life and that farming is now his principal occupation. That his main crops are cotton, corn, peas and oats and he has raised some tobacco.

That he agrees entirely with the general tenor of the affidavit of Mr. C. H. Rivers, an intelligent farmer of long experience, and he, therefore, adopts it as his own. That his experience and observation as a farmer lead him to affirm that the recent enactment, called the "Open Formula Act", is wise legislation very much to be desired in the now splendid effort to farm intelligently, and most certainly it is not an unfair and unreasonable requirement that under our laws the user of guano should have a reasonable idea of the plant food values and the approximate amount in pounds of same and its source and adaptability to his various soils and plants.

H. F. King.

Sworn to before me August 7th 1936. Vivian Hartman, Notary Public for South Carolina. (L. S.)

[fol. 183] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

AFFIDAVIT—Filed December 11, 1936

Personally came before me C. H. Rivers and on oath said:

That he is a native of Chesterfield County, South Carolina, and resides just out of the town of Chesterfield, and

that he has for many years, and is now, engaged in farming as his chief occupation and that it has been his earnest purpose to farm intelligently and to that end study his soil and its adaptability to various crops and the proper food as indicated to apply thereon with the view of reasonable crop returns and the improvement of his lands.

A most serious handicap has been encountered from the lack of information as to the approximate amount and value of each of the several chemicals and properties, and the source thereof, contained in guano.

Those depending upon commercial fertilizers largely, if not entirely, as the important aid in successful crop growing have purchased and applied guano "in simple childlike faith" as to its contents and source and its adaptability to land and the crops grown thereon.

The preservation and improvement of our soil and the returns therefrom are of transcendent importance to all the people, and the farmer is now being substantially aided and greatly encouraged to prepare, plant and till his lands intelligentiy and to apply to all crops grown thereon the [fol. 184] plant food necessary and adaptable thereto, and it is highly important, and it is fair, that he should know, as nearly as can be ascertained, the contents, the source from whence derived, and the pounds per hundred pounds of plant food elements contained in a sack of *q*uano.

Fertilizers amounting to many tons are used yearly by deponent on his several farms and very naturally he has felt that the law relating to fertilizers was inadequate in that sufficient protection and assurance were not given the user. The enactment at the recent session of the General Assembly, called by some "The Open Formula Act", gives the farmer information and protection to which he is reasonably entitled as a purchaser of guano who intends to use the product (in many cases with other elements) in the cultivation of the several crops to be grown on his lands.

Much more can fairly be said in support of the justice and wisdom of this law.

C. H. Rivers.

Sworn to before me August 7th 1936. Vivian Hartman, Notary Public for South Carolina. (L. S.)

[fol. 185] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

AFFIDAVIT—Filed December 11, 1936

STATE OF SOUTH CAROLINA,
County of Beaufort:

Personally appeared before me T. H. Seabrook, who being first duly sworn says: That he is a native of Charleston County, being born and reared on a Cotton and Truck farm of that county; that he is a graduate in agriculture of Clemson Agricultural College; and that he has been engaged in vocational and Extension Agricultural work for fourteen years.

Deponent further states that he has been the County Farm Agent of Beaufort County for six and one-half years and feels that from his knowledge of farming in this county that the passage of the Act known as the Open Formula Act was a necessity and that all farmers, large and small, of Beaufort County, who have been approached relative to the Act are all in favor of same, and hail the passage of it with satisfaction. Beaufort County is strictly an agricultural County, its primary source of income being derived from truck crops, the production and marketing of these being a highly specialized art. All truck crops grown and produced here depend for successful development upon the kinds and amounts of fertilizer used. These crops require more fertilizer than do other crops grown in this State.

[fol. 186] Deponent further says that six years ago when farmers of this county experienced considerable trouble and loss with various truck crops, and particularly Irish potatoes, that he, as County Farm Agent, called in Pathologists, Entomologists and Agronomists to ascertain the trouble. It was found that the entire trouble was due to certain fertilizer ingredients. This led to various soil tests and investigations during the following years, and it was found that special mixtures of fertilizers were harmful to such crops as Irish potatoes and tomatoes during seasons of drought. Therefore, it is considered essential that farm-

ers of this county know exactly what ingredients are in a fertilizer mixture before purchasing same for their crops.

Deponent further says that a fertilizer mixing plant was set up in Beaufort County during the year 1936 for the purpose of mixing the exact ingredients into mixtures for potatoes and tomatoes which had been recommended to the growers for their soil after tests had been made by officials of the Clemson College Extension Service, and that approximately one thousand tons were so mixed and used in the County with excellent results in spite of drought. Similar results were obtained with special mixed formulas obtained in Savannah, Georgia by seven Beaufort County farmers.

Deponent further says that it is known from experience that soils of this county need considerable amounts of mineral ammonia, especially on farms where considerable truck crops are produced, and that farmers should know the exact source of such mineral ammonias, since certain of these truck crops require ammonia from one source while other crops would require it from another.

Deponent further says that farmers of Beaufort County are now making a closer study of their soils and their fertilizer needs than ever before. That tests of soils to determine what is known as Ph value tests are made before fertilizer is applied, and the Ph value of a soil determines to a great extent the kinds and amounts of fertilizers to use, [fol. 187] and it is therefore highly important that farmers know the sources of all elements of plant food in their fertilizer mixtures and the Open Formula Act provides just that.

T. H. Seabrook.

Sworn to and Subscribed before me this 10th day of August, 1936. W. Brantley Harvey, Notary Public for South Carolina. (L. S.)

[fol. 188] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT FOR THE WESTERN DISTRICT OF SOUTH CAROLINA

In Equity

[Title omitted]

OPINION—Filed December 9, 1936

Introduction

The function of an Opinion in an equity case where full Findings of Fact and Conclusions of Law, separately stated, are also filed, is to tie the two together so as to clarify and [fol. 189] explain the decision of the Court. Manifestly, Equity Rule 70½, reading as set out below[1] requires the Trial Court to present its findings of fact on vital matters in a much more definite way than was formerly the practice. An Appellate Court can much better ascertain the views of the Trial Court about questions of fact when they are separately stated than disentangle them from a general opinion in which Findings of Fact are intimately intermingled with legal propositions. In this particular case, we have taken the view that a full statement of the Findings of Fact is not only necessary but is the most important element in the decision of the case. After all in constitutional cases where the attack on a State Statute is made on the ground of arbitrariness, impossibility of enforcement and unreasonable hardship, the decision of the final issue depends essentially upon the factual showing. The Supreme Court of the United States has only recently in the Stockyards case, 298 U. S., 38, and in the case of

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[1] "In deciding suits in equity, including those required to be heard before three judges, the court of first instance shall find the facts specially and state separately its conclusions of law thereon; and, in granting or refusing interlocutory injunctions, the court of first instance shall similarly set forth its findings of fact and conclusions of law which constitute the grounds of its action.

"Such findings and conclusions shall be entered of record, and, if an appeal is taken from the decree, shall be included by the clerk in the record which is certified to the appellate court under rules 75 and 76. (Amended Nov. 25, 1935.)"

Walters vs. N. C. & St. L. Railway, 294 U. S., 405, pointed out that in cases of this character the decision of the questions of fact is the important matter both in the Trial Court and on final appeal to the Supreme Court of the United States.

[fol. 190] Subject Matter of the Suit

Agriculture is the chief industry of the State of South Carolina. The census of 1930 shows that most of the adults in the State were engaged in farming and derived their chief support from agriculture. The witness, Hamilton, thoroughly familiar with agriculture in South Carolina, testifies as follows:

"Now, my work, that has been continuously with the farmers, and one of the greatest problems that we have and the subject which I have had to give more information on to the farmers in South Carolina is fertilizer. We have in South Carolina 165,000 farmers—I don't mean rural population, but 165,000 farms or farmers which include sharecroppers, tenants, wage hands and the land owners. Almost without exception every one of those farmers, his living and his welfare is affected by fertilizer because every one of them that grows any cash crop uses fertilizer with the exception, I will admit, in the time of depression when they don't have money to buy fertilizer. If it went up, in case they choose to do without it, they do without it because they cannot pay for it."

The use of commercial fertilizers in agriculture has always been a practice in this State. As testified in this case, most of the farmers in South Carolina use commercial fertilizer and the annual expenditure therefor runs into the millions of dollars. Of course, large use is made of the manure obtained from domestic animals on the farms themselves, but from the very beginning it has been recognized that this source is not only inadequate so far as quantity is concerned, but has not the variety of content necessary for producing the staple crops of the State. Wise or unwise, South Carolina has always produced marketable crops such as cotton, truck and tobacco very greatly out of proportion to the lifestock raised in the State. To meet this demand for commercial fertilizer corporations have de-

veloped this enormous business. The commercial fertilizers are manufactured and sold in this State, and such manufac- [fol. 191] ture and sale have inevitably been the subject matter of legislation by the State Legislature. In the early nineties an agricultural college was established in the State. This institution, Clemson Agricultural College, has grown rapidly and has through many agencies spread the information with reference to the use of fertilizers to the farmers themselves. By reason of Federal and State Legislation and enabling appropriations, County Demonstration Agents have been abroad in the land, and with more or less efficiency and success have brought the benefits of scientific investigation and experiment to the farmers and enlightened them on the proper use of commercial fertilizers. Clemson Agricultural College has been largely supported by a sales tax on the fertilizers used in the State. The theory is that the college and its ancillary services are primarily for the farmers and it is nothing but just that the proceeds of the sales should support this institution and its extension work. Therefore, we find that the Trustees of this institution are logically charged with the enforcement of the fertilizer law. These Trustees are, therefore, properly named as the defendants in this suit.

Statutes of the State have for years made it necessary for the fertilizer companies to show by way of tag the contents of the particular mixture contained in the sack. As pointed out in the Findings of Fact in great detail, the farming population has for a long time known the particular value of three major plant food elements. These three plant foods are phosphoric acid, nitrogen and potassium. The terminology used in statute and regulation has not always been uniform or accurate. Phosphoric acid is valuable because it contains a large percentage of the ulti- [fol. 192] mate chemical element phosphorus. Nitrogen is the ultimate chemical element of value contained in the substances variously referred to as nitrogen and ammonia. Potassium is the ultimate chemical element contained in the substance more frequently referred to as potash. So in this discussion we refer to these major plant foods as phosphoric acid, nitrates and potash. For many years the law required the analysis of the final mixture as put into the sack to be shown on the tag attached thereto and to reveal the percentage, in the final mixture, of these three major plant foods.

As science and experience have enlightened the farmers about the use of fertilizer, regulation by the legislature has required the publication on the tag of increasing information. Several years ago a statute was passed requiring the fertilizer companies to declare from what sources these major plant foods were obtained. This requirement was generally found to be so reasonable and to meet such a reasonable need for information on the part of the farmers that no serious question has ever been made of its propriety in fact or in law. Additional legislation has required the information to be given with greater particularity than this so far as the nitrates are concerned. The function of the nitrates generally is to speed the growth of the plant during the growing season. Nitrates, if rapidly soluble, accelerate the growth of the plant itself in a very positive and evident way. Nitrates, when less soluble, are no less valuable for certain types of crops on certain types of soil, but the effects are distributed over a longer period and the increased rate of growth not so noticeable. It was, therefore, nothing but reasonable that the manufacturer and [fol. 193] seller of commercial fertilizer should be required to show the nature of the nitrates supplied in his mixture offered for sale with respect to "solubility" or "insolubility". We find under the testimony that a definite classification of nitrates into "soluble" and "insoluble" has grown up and come to have very definite meaning with respect to commercial fertilizers.

But as time has gone on and the farmers have become more and more enlightened, and the Legislature more and more mindful of the needs and desires of the farmers, it was felt that even this information was not sufficient and that not only should the purchasing farmers have information as to the major plant foods contained in the final mixture and the sources from which they were derived, but that they were entitled to a quantitative statement of the poundage of such sources used by the manufacturer in supplying the desired percentage of each major plant food contained in the final mixture. This is better understood when we explain the meaning of the word "source". In the fertilizer business, manufacture, sale and use, the word "source" means that substance which is commonly used as a carrier for a particular plant food element. For example, nitrate of soda is a source or carrier of the desired plant food nitrogen. Nitrate of soda also contains a small

percentage of potash and, therefore, nitrate of soda is properly referred to as the "source" or "carrier" for both nitrogen and potash.

Pursuant to this feeling, therefore, there was passed at the 1936 session of the Legislature of South Carolina an Amendment to the fertilizer laws putting into effect what is popularly known as the "Open Formula". This Amendment was added at the end of one of the important sections [fol. 194] of the fertilizer law as it then existed and is as follows:

"'(b) That the amount and *Analysis* of each material, or source, of each plant food element used in manufacture, of a fertilizer mixture containing two or more plant food elements be stated on a tag attached to each sack or container, such amounts of materials to be stated in pounds per hundred pounds of mixture contained in the sack or other container. This statement of pounds of material used in the manufacture, of a fertilizer mixture shall be in addition to the statement of chemical analysis as required by Section No. 6366 of the Code of Laws of South Carolina.' " (Italics ours.)

The fertilizer companies have brought this suit to enjoin the enforcement of this Open Formula Statute, and thus the questions are presented to this Court for decision. The attacks on the statute are primarily on constitutional grounds and we may sum them up in four major contentions. The stated contentions of the plaintiffs are well phrased but for purposes of clarity and discussion as we view the case, we see fit to phrase them as follows:

I

That the statute, couched in indefinite and inaccurate language, is incapable of reasonable enforcement. That the only honest enforcement on the part of the enforcing agencies will amount to unreasonable and arbitrary taking of plaintiffs' property and so harm their businesses as to confiscate and destroy them. Stated in other words, that honest compliance on the part of the companies with the terms of the statute will be so expensive as to destroy the plaintiffs' businesses in violation of their constitutional rights.

II

The second constitutional question, as we view it, is closely akin to the first one and dependent upon the decision of the first question for a correct understanding thereof. [fol. 195] It is briefly that the statute, even if susceptible of a reasonable interpretation by enforcing agencies, and even if susceptible of compliance by the plaintiff companies, nevertheless amounts to an unlawful, unreasonable and unconstitutional exercise of the police power of the State of South Carolina. That the statute has no foundation in the necessities of the purchasing farmers and will not tend in any reasonable way to satisfy an existing need, but only serve to satisfy curiosity on the part of the farmers.

We say again that the decision on this constitutional question depends largely upon our decision on the first constitutional question presented; namely, upon the interpretation of the statute.

III

That the statute when enforced will deprive the companies of the value of certain property rights which they have by reason of the value of secret formulae and trademarks which they have built up by years of experience and at an enormous expense. That this destruction of property values is not necessary to meet any existing needs of the farmers of the State, is without compensation, is arbitrary and unreasonable and amounts to the taking of property without due process of law and denies to the plaintiffs the equal protection of the law; all in violation of the Fourteenth Amendment to the Constitution of the United States and similar provisions of the Constitution of South Carolina.

IV

A final contention is made by the plaintiffs that the Statute is unconstitutional because it makes no provision for the disposition of existing stocks of fertilizer on hand in South [fol. 196] Carolina and with respect to which compliance with the new Statute is practically an impossibility. That this destruction of the value of these existing stocks is the taking of property without due process of law, is unreasonable and arbitrary, and being a taking without compensation is in violation of the Fourteenth Amendment to the Federal Constitution.

In our opinion, the first two contentions are the vital ones. Is the Statute voided for indefiniteness and is it impossible of enforcement, and resulting compliance without unreasonable expense? We must, therefore, address ourselves to the construction of this Amendment putting into effect the Open Formula Statute. In doing so, we invoke immediately a well accepted principle of construction frequently applied in cases of this character. It is well settled that in construing a Statute which has not yet been applied by a regulatory body charged with its enforcement, a Court must assume that the Statute will be given a reasonable and constitutional interpretation if possible. The Board of Trustees of Clemson College have not as yet issued any rules and regulations as to the enforcement of this Statute. At this stage we are without the benefit of knowing how they will construe the individual phrases used in the Statute or how they will apply the Statute as a whole. We must, therefore, assume that both in determining the meaning of certain key phrases in the Statute and in determining the effect of the Statute as a whole this administrative body will, as they should, give both individual phrase and entire Statute, a reasonable interpretation. We do have, however, as indicative of the probable compliance with this principle of statutory construction by the enforcing agencies the benefit of their spirit and atti- [fol. 197] tude in enforcing previous statutes. It is important to note that several of the key phrases in this Statute have occurred from time to time in previous statutes regulating the fertilizer business and have been given a reasonable and sane construction by the enforcing agencies. We take occasion at this point in our Opinion to call particular attention to this matter because we think that it is vital to the correct understanding of our decision. The proper construction by us, and by the administrative agencies of the word "analysis" as used in the Statute is important in determining whether or not the Statute as actually applied will be reasonable or unreasonable. We have been at great pains in our Findings of Fact to deal with this word "analysis" and have pointed out with the greatest clarity of which we are capable, that it must be given a reasonable interpretation and not a highly technical interpretation. As we have pointed out we do not view it as requiring a complete chemical analysis of every substance,

however remote its origin, entering into the final product. It is significant to here point out that even where the phrase "chemical analysis" has been used in previous statutes, such chemical analysis has been construed to be sufficient if it shows the three major plant foods with which the farmers were familiar and about which they desired knowledge in making their choice of fertilizers. If this administrative agency has given the phrase "Chemical analysis" such a reasonable interpretation, we feel that we are justified in assuming that such a reasonable interpretation will be made of the broader term "analysis" as it appears in the instant Statute.

This rule of statutory construction which the Court has invoked is important also in determining the anticipated regulations with respect to the quantitative showing re- [fol. 198] quired by the Statute. It may be conceded that the Statute would put an unreasonable, arbitrary and unjust burden upon the companies if it should be construed to mean that the companies would be required by the enforcing agencies to keep separate books on the history of the process of mixings for each one hundred pounds. This would manifestly increase the amount of bookkeeping necessary, would increase the amount of labor required, would increase the size of the mixing and storage bins necessary and would increase all of these factors to such an extent that the resulting expense would practically mean the destruction of the complainants' business. Indeed, it would appear reasonable that these increased costs on the final product would practically mean that the farmers could no longer buy commercial fertilizers except those of the very cheapest grades. But, instead of presuming that the Statute will be given such a high-handed, unreasonable and vicious interpretation by the enforcing agencies, both experience and well settled principles of law justify us in assuming that the interpretation and enforcement will be reasonable and just. The testimony shows abundantly that, while smaller mixtures are sometimes made, the usual volume involved in what we would call a mixture from the manufacturers' standpoint is a pile of practically uniform composition ranging in size from one thousand to five thousand tons. The physical way in which each batch of fertilizer as it comes from the machine mixer is poured upon the curing and storage pile is really the key to the under-

standing of this phase of the case. The testimony is that each batch as it falls from the mechanical mixer is taken up overhead and poured on the pile in such a way that a small portion of each batch finds it way to the three if [fol. 199] not the four corners of the pile. Indeed, as the final mixture of fertilizer falls on the storage pile, it falls in conical rather than a cubical form.

From this we conclude that a reasonable interpretation of the Statute by the enforcement agencies, such as we have a duty to assume they will make, would be satisfied if the revelation on the tag showed the general average with respect to all items of information contained on the tag coming from an honest desire to make the pile of five thousand tons of uniform composition. If this is what the Statute requires with reference to the history of each mixture and with reference to the piling and storing thereof, there is practically no additional burden or expense put upon the manufacturing company which is not already incident to the business.

But even if there is demand for unusual mixtures, and even if the manufacturers do from time to time have to keep fuller records and more intricate historical showings of the processes with respect to the mixtures finally offered for sale, all of this is no new element in the business. Neither will the enlargement of warehouses within reasonable degree for storing of many smaller piles bring a new or unreasonably expensive element into the business. Fertilizer factories, by reason of the odors emitted, are generally located on spur tracks, well away from residential and business centers. The storage sheds are simple wooden sheds over concrete floors, and enlargement of these rather rude structures over inexpensive real estate will not actually increase the cost per ton to any great extent. We cannot help but think that the plaintiffs, both in testimony and argument, have over-emphasized the extent of this increased expense.

[fol. 200] The testimony is abundant that upon specific demand the companies have already been mixing special mixtures for large farmers, and storing them separately. Accounting methods have already determined the increased charge which takes care of this extra expense of records and storage to the satisfaction of the selling companies. The testimony is that a charge of from 50 cents to $2.50

has heretofore taken care of this extra charge in sporadic cases. Certainly if the demand for such better records and enlarged storage is going to be widespread, the charge, instead of increasing, should decrease. Having the opinions indicated in this brief discussion of the interpretation and application of the Statute as it will probably be made by the enforcing agencies, we can see nothing to the plaintiff's contention in their first attack on the constitutionality of the Statute.

We do not leave this phase of the case, however, without saying that final word on the interpretation of this Amendment will not be with the administrative agencies but with the Supreme Court of the State of South Carolina, and of course that Court will put reasonable construction upon both particular phrases and purport of the entire Statute. This proposition that a Court in passing upon the constitutionality of a Statute must assume that enforcing agencies will give reasonable and sensible interpretation rather than unreasonable and arbitrary interpretation is so well settled that the authorities cited here are cited in the footnote rather than in the body of this Opinion. The rule can be stated in stronger terms, that in a situation like this, the Court must assume that a statute, if capable of an interpretation effecting a constitutional result, will be given that interpretation by both state administrative [fol. 201] agencies and State Supreme Court charged with the duty of finally interpreting a State Statute.

We are not willing at this time to seriously entertain the prediction that either agency of state government, executive or judicial, will make the strained construction of the Statute of which the plaintiffs contend that the Statute is capable. We are prevented from doing so both by common sense and well settled principles of law.

2. Closely akin to the proposition of law we have just been discussing are those involved in dealing with the Second Question of Constitutional Law. Is the Statute here such an unreasonable, arbitrary and high-handed exercise of the police power as to be unconstitutional under the Federal Constitution?

First, it will be our duty to decide whether or not the Statute as reasonably interpreted tends to accomplish the evident purpose of the Legislature.

Secondly, if it does, does it do so in a reasonable way?

In our Findings of Fact we have discussed this phase very fully. We have been at great pains to point out the increasing knowledge on the part of the farmers of South Carolina of the correct use of fertilizers. If we felt that the open formula statute simply put an additional burden upon the plaintiffs without a corresponding benefit to the intended beneficiaries of the Statute, it would seem that we would be forced to the conclusion that the Statute was unreasonable and arbitrary. However, it is shown that, in the progress which agriculture is making in this State, the farmers know very well the practical results obtained from the different types of fertilizers. There was a time when a [fol. 202] bald statement that the fertilizer was 8-3-3 was sufficient. The farmer in a rough sort of way knew that phosphoric acid, nitrates and potash were beneficial to his land, but now he knows a great deal more. He knows a great deal more not only about the fertilizers themselves but he knows a great deal more about his own land and its particular needs. His choice of a fertilizer to meet his particular needs, both as to plants raised and soil cultivated, is now made with a great deal of intelligence; he, therefore, has both the need and the desire to know with increased certainty both the analysis and the history of the fertilizer he is buying. To meet this need in an effective way, the Legislature passed the Statute. The Statute when reasonably interpreted tends in a definite and reasonable way to meet this existing need. This test as to the validity of the Statute under the police power has, therefore, been met and the Statute must be sustained against this attack.

The attack on the Statute as being beyond the police power on the theory that it is void and incapable of honest enforcement and obedience has already been discussed in the first phase of this Opinion. The State has under its police power the right to require manufacturers to operate under more expensive conditions. It has a right to require that more elaborate and accurate records be kept as to a particular business, provided, that such increased expenses do not so increase the costs of manufacture and record as to increase the costs of the finished product to such an extent that the business is practically destroyed. On this score, in our Findings of Fact we have found that the increased costs of manufacture and record are met by a small charge which, as a matter of custom, has been passed on to

[fol. 203] the consumer, neither is the amount of this charge so great as to suggest in anywise that the quantity of fertilizers purchased will be substantially decreased. Indeed, acording to the theory of the plaintiff's testimony, the better the fertilizer meets the needs of the farmers the more they will buy and the better their crops will be on a given acreage, and the better situation the farmers will be in financially to pay for the fertilizer which they purchase. The testimony of various experts and sales managers, plaintiffs' own witnesses, is that the better the fertilizer and the more intelligent its choice, the better is the result for the farmers. They say that this is true both as to individual farmers and to agriculture generally.

3. What about property rights in the shape of secret formulæ and trade names, and their destruction by the Statute? To begin with, it is doubtful whether these secret formulæ and trade names belong personally to the plaintiffs. These secret formulæ used by the plaintiffs have been so largely contributed to by the experience of the farmers themselves, by the scientific revelations of Federal and State agronomists and lessons learned by Clemson College in its various experiment stations, that it is rather difficult to say that they are the personal property of the plaintiffs. They are rather the adoption by the plaintiffs of common revelations made by many agencies in the search for better and cheaper fertilizers. It is true that the companies themselves have done their part and by experiment and research made definite contribution along this line.

But, even if we were convinced that the secret formulæ here shown by much testimony to be the basis of property [fol. 204] rights cognizable in the courts, yet these rights must yield when they conflict with a valid exercise of the police power of a State. It may seem hard that these secret formulæ cannot be universally recognized and protected by the Courts, but it is well established that secret formulæ as well as other rights must frequently yield to the valid exercise of the police power by a sovereign State. The control of proprietary medicines by State and National is an exact analogy. If secret formulæ of medicines for human consumption can be forced to revelation in the exercise of police power it seems to follow, as night the day, that secret formulæ with respect to the supply of plant food must likewise yield to a reasonable and valid exercise

of police power. The care for the health and well being of people who take medicines is a proper subject for the exercise of police power on the part of a vigilant legislature in a progressive State. We can see no reason why the Legislature of a State may not compel a reasonable revelation of the source and nature of the plant foods contained in a fertilizer sold to the farmers of the State. It must be remembered that agriculture constitutes the major industry of South Carolina, it is the industry from which hundreds of thousands draw their complete livelihood. Surely in the exercise of police power over the sale of commercial fertilizer, the Legislature of an agricultural State has the power to subordinate rights growing out of secret formulæ to a reasonable and valid exercise of the police power vested in the State.

[fol. 205] We have stated the fourth contention of the plaintiffs as follows:

"IV

"A final contention is made by the plaintiffs that the Statute is unconstitutional because it makes no provision for the disposition of existing stocks of fertilizer on hand in South Carolina and with respect to which compliance with the new Statute is practically an impossibility. That this destruction of the value of these existing stocks is the taking of property without due process of law, is unreasonable and arbitrary, and being a taking without compensation is in violation of the Fourteenth Amendment to the Federal Constitution."

This attack seeks to condemn the Act as unconstitutional because of its application to existing stocks of fertilizer on hand and unsold, even if it is upheld as to stocks of fertilizer resulting from future manufacture. We think that this contention of the plaintiffs amounts to nothing, in view of the interpretation of the Act which we have set forth in our answer to the first constitutional objection. Every reason which suggests that a sensible interpretation will be given by the administrative agencies as to the future manufacture applies with even greater force to their attitude towards existing stocks. There is nothing in the Statute or in this suit on the Statute which would deprive the enforcing agencies of their authority to act sensibly and

reasonably with respect to the existing stocks. The companies admittedly have available the records as to the materials which have gone into the fertilizers which they have on hand. All that we have said about the possibility of showing the contents of each sack on the principle of averages applies to the stocks on hand as well as to the manufacture of fertilizer in the future. It may be that the search for data in order honestly to comply with the Statute, [fol. 206] as it applies to the stocks on hand, will involve retrospective work rather than prospective work. There is, however, no showing before us that such retrospective work on the records of the companies will not be reasonably accurate and will not enable the companies to comply in a reasonable way with the terms of the Statute. It is true that the companies were not advised when these stocks were manufactured that they would be required to publish such data as is now required by the Open Formula Statute. But they, the plaintiffs, upon whom the burden rests to show that it is impossible to obtain such data from the records which they have, or that the obtaining of such data would be an unreasonable and arbitrary burden, have not shown that to this court. In adjusting the terms of the Statute to the data capable of revelation by reasonable search, the enforcing agencies will, we are sure, act with common sense, and that no capricious or vicious action on their part will characterize their attitude towards the disposition of these existing stocks. Administrative agencies vested with discretion do not act stupidly, but should they adopt such a course, recourse can still be had to the court for injunctive relief. As a matter of fact, a long period of immunity has been accorded the plaintiff companies during the pendency of this suit.

We feel, too, that under the testimony we could dispose of this contention because of the small amount of fertilizers on hand when viewed in comparison with the enormous business done by the plaintiff companies. The amount of fertilizers on hand is so small as hardly to merit special consideration, and certainly the whole Act will not be declared invalid on account of the remnants in the hands of a few companies. Injunction would not be granted to protect these remnants from reasonable enforcement even if [fol. 207] the law were invalid as to them, because, in our opinion, there would be a complete and adequate remedy

at law. If the State sought to prosecute the companies for disposing of such small stocks, the defense of unconstitutional application of the Statute to the sale of these small stocks could be set up as a defense to the criminal prosecution. If the form of the action turns out to be a suit for the penalties, under the applicable statutes, the companies could still set up the unconstitutional application of the Statute in this respect as a defense to such suit for the penalty. In either type of action a full, complete and adequate remedy at law will be available to the plaintiff company which still has on hand any considerable amount of fertilizers. Then, if the essential elements of Federal jurisdiction are present, such action can be tried in the Federal Courts and the complete and adequate remedy at law will therefore be one available in the Federal courts. (Matthews v. Rogers, 284 U. S., 521.)

All through this opinion we have avoided any discussion at all on the wisdom of this legislation. We have been of course mindful that the wisdom and policy of such legislation is a question for the Legislature. The fact that we may think that the Statute does require the publication of some information which may not be necessary at all times to every purchasing farmer does not justify us in striking down the Statute as being unreasonable and arbitrary. As we have said before, we must presume that the enforcing agencies will give the Statute a reasonable and sensible construction both as to particular term and general purpose. The testi- [fol. 208] mony shows clearly that they have so acted in similar matters over a long period of years. But quite apart from this, we must presume that the enforcing agencies will act in a constitutional way and give the Statute an interpretation which will effect a constitutional result, rather than go out of the way and presume that the enforcing agencies will put an unconstitutional interpretation upon the Statute simply because it is stoutly contended that such an unconstitutional interpretation is possible. We have endeavored to point out that the interpretation of the Statute which the plaintiffs insist may be made would be highly technical and arbitrary, and we are prevented from considering this interpretation by previous conduct of the enforcing agency, by common sense and above all by well settled principles of statutory construction.

In this Opinion we have avoided the citation of many cases which would sustain the rather primary principles of

constitutional law herein discussed. The cases which we have considered and which have controlled our decision on various phases of the case, are cited in notes at the end of this Opinion. For the reasons set forth in this Opinion, which must, as we have said be read in connection with the rather full Findings of Fact herewith filed, we think that this Bill should be dismissed and the Injunctions, both Interlocutory and Permanent, should be denied.

(Signed) John J. Parker, United States Circuit Judge.

December 5th 1936.

(Signed) H. H. Watkins, United States District Judge.

December 8th 1936.

(Signed) J. Lyles Glenn, United States District Judge.

December 4th, 1936.

[fol. 209] NOTE II.—The proposition is stated as follows:

"The statute must be construed if fairly possible so as to avoid not only the conclusion that it is unconstitutional, but also grave doubts on that score. In other words, in testing the constitutionality of a statute, the language must receive such construction as will render it constitutional, if it is reasonably susceptible of such interpretation."

Otherwise stated:

"When the constitutionality of a statute is questioned, it is the duty of the Courts, and also a rule of construction to adopt such construction as will make the statute constitutional if its language will permit."

Presser v. Illinois, 116 U. S. 252, 6 Sup. Ct. Rep. 580; Phelps v. United States, 274 U. S. 341, 47 Sup. Ct. Rep. 64; Bauman v. Ross, 167 U. S. 5[illegible], 17 Sup. Ct. Rep. 966; United States v. Coombs, 12 Pet. 72; The Abby Dodge, 223 U. S. 166, 32 Sup. Ct. Rep. 310; United States v. Standard Brewery, 251 U. S. 210, 40 Sup. Ct. Rep. 139; South Utah Mines & Smelters v. Beaver County, 262 U. S. 325, 43 Sup. Ct. Rep. 577; Lindsley v. Natural Carbonic Gas Co., 162 Fed. 954, 221 U. S. 61, 31 Sup. Ct. Rep. 337, 55 L. Ed. 369; St. L. Southwestern R. Co. v. Arkansas, 235 U. S. 35 Sup. Ct. Rep. 99.

NOTE III.—The rule of construction also has an extension, the Court is under the duty not only to presume that the statute is constitutional but also to presume that enforcing agencies will give the statute a reasonable and constitutional interpretation. See Plymouth Coal Co. v. Pennsylvania, 232 U. S. 531, 34 Sup. Ct. Rep. 359; Fox v. Washington, 236 U. S. 273, 35 Sup. Ct. Rep. 383, 59 L. Ed. 573.

NOTE IV.—Questions of policy are for the Legislature and not for the Court. The rule is well stated as follows:

"The police power springs from the obligation of the State to protect its citizens and provide for the safety and good order of society, and permits reasonable regulation of rights or power in particulars essential to the preservation of the community from injury."

Erie Railroad Co. v. Williams, 233 U. S. 685, 34 Sup. Ct. Rep. 761, 58 L. Ed. 1155; L'Hote v. New Orleans, 177 U. S. 587, 20 Sup. Ct. Rep. 788, 44 L. Ed. 899; Graves v. Minn., 272 U. S. 425, 47 Sup. Ct. Rep. 122, L. Ed. 331; N. Y. Ex. Rel. Silz v. Hesterberg, 211 U. S. 31, 29 Sup. Ct. Rep. 10, 53 L. Ed. 75; Holden v. Hardy, 169 U. S. 366, 18 Sup. Ct. 383, 42 L. Ed. 780; Purity Extract & Tonic Co. v. Lynch, 226 U. S. 192, 33 Sup. Ct. Rep. 44, 57 L. Ed. 184.

[fol. 210] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

FINDINGS OF FACT—Filed December 9, 1936

History and Background of the Suit

I

The plaintiff, National Fertilizer Association, Incorporated, is a corporation having no capital stock, organized and existing under the laws of the State of Maryland. It is organized for the purpose of cooperative action in the de-
[fol. 211] velopment of the fertilizer industry as a whole and operates throughout the major portion of the United States. Its members contribute by way of dues to its support. A number of the co-plaintiffs in this suit are members of this association. The co-plaintiffs in this suit are per-

sons, individual firms and corporations engaged in the manufacture and sale of fertilizers and operate in whole or in part in the State of South Carolina.

II

Defendants are members of and constitute the Board of Clemson Agricultural College and are charged by the laws of the State of South Carolina with the enforcement of the various laws of the State which relate to the control of fertilizer manufacture and sale in the State of South Carolina. Clemson Agricultural College is an institution supported by the State by direct appropriation and by the allocation to it of the fertilizer inspection taxes. The control of the fertilizer business by the Trustees of the College has, therefore, both an historical and a logical basis. John M. Daniel is the Attorney General of South Carolina and in proper cases conducts in the name of South Carolina suits to enforce the fertilizer law. He has this authority both in actions brought directly in the name of the State and those brought in the name of the State for the benefit of private individuals seeking redress under the fertilizer law.

III

The South Carolina Legislature has for years passed many statutes controlling the manufacture, sale and labeling of fertilizer used by the farmers in the State. For many years the law has required manufacturers and sellers of fertilizer to reveal by a tag attached to the sacks the analysis of the fertilizer contained in the sacks. This information has been commonly supplied and is a matter of general knowledge to the farmers who purchase the fertilizer. The defendants in this suit have for years enforced the provisions of the statutes requiring the disclosure of this infor-
[fol. 212] mation to the farmers. The testimony shows abundantly that the whole matter has been handled in a remarkable spirit of cooperation and good-will between the enforcing officers and the fertilizer companies.

IV

The analysis which has been shown on the tag before the passage of the 1936 Amendment (hereinafter referred to)

has disclosed the percentage of the amount of plant food elements used in the manufacture. This information was originally confined to the percentage disclosed as to the three main plant food elements. These plant food elements being, stated in the order of their use in common parlance, Phosphoric Acid, Nitrogen and Potash. Several years ago the law was amended so as to require the fertilizer to show not only the percentage of each major plant food contained in the mixture but to reveal the source from which each major plant food is derived.

V

Further legislation regulated particularly the use and disclosure of different types of nitrogen in the fertilizer. Section 6367, Code of Laws, 1932, recognizes the distinction between water-soluble and available water-insoluble nitrogen. This regulation was well founded both as to the possibility of manufacture and as to the varying needs of the purchasing farmers; nitrogen being needed in many cases in the water-soluble form and being needed in other cases in the water-insoluble form. In most cases the combination of the two being the proper form in which nitrogen was supplied to the growing crops. The enforcement of this provision with reference to the nitrogen content of fertilizer has been found to be practical.

VI

As a result of years of experiment by Clemson College, through its experiment station, and as a result of further experiments by private individuals, it was thought advisable to require the disclosure of an additional type of in- [fol. 213] formation which had never been required before. All of this resulted in the passage by the Legislature of 1936 of the Amendment to Section 6367. This Amendment is as follows:

"• • • (b) That the amounts and analysis of each material, or source, of each plant food element used in manufacture, or a fertilizer mixture containing two or more plant food elements be stated on a tag attached to each sack or container, such amounts of materials to be stated in pounds per hundred pounds of mixture contained in each sack or other container." • • •

This Amendment has been published information and has been referred to throughout this litigation as the "Open Formula Act."

VII

Stated in its simplest terms the force of this Amendment is to require the manufacturers and sellers of fertilizers to state not only the percentage of each plant food element used in the manufacture and not only by the use of general terms the source of that element, but to state in addition the number of pounds of each particular source, or carrier used in each one hundred pounds of the mixture contained in the sack of fertilizer.

VIII

A simple illustration shows the effect of the 1936 amendment upon the fertilizer business as it had been regulated by the previous statutes. We take a common brand of fertilizer to illustrate—"8-3-3" is a mixture commonly used by many cotton farmers in the State of South Carolina. In fertilizer language this means that the final mixture as analyzed by the chemist at the end of the process of manufacturing and mixing contains three major plant food elements in the following proportion: 8 per cent phosphoric acid; 3 per cent nitrogen and 3 per cent potash. In addition to this bald statement of the percentage analysis, the law had previously required the manufacturer to state from what source the 8 per cent phosphoric acid was derived. Likewise the sources of the nitrogen and potash were required to be stated. For example, phosphate rock as dissolved by mixture with sulphuric acid is a common basis of phosphoric acid as used in fertilizer. If the 8 per cent of [fol. 214] phosphoric acid as contained in the final mixture comes from this source, a bald statement that the source was "Super-Phosphate" met the requirements of the statute.

There are many sources of nitrogen supply and the use of these various sources is not at all uniform. The sources of potash, while not so varied, nevertheless covers quite a wide range of materials. The 1936 Amendment requires the fertilizer company to state on its tag not only the source of each major plant food element but to go further and reveal the actual number of pounds of source used to obtain the percentage of each major plant food element shown in the analysis of the final mixture. For example, if the nitro-

gen carriers were both cotton seed meal and nitrate of soda the net result of 3 per cent nitrogen might be obtained from 50 pounds (in 100) of 7 per cent cotton seed meal and 20 pounds (in 100) of 18 per cent nitrate of soda. Previous to the 1036 Amendment it was sufficient to state that the 3 per cent of nitrogen was obtained from cotton seed meal and nitrate of soda without revealing the poundage of each source used in the mixture.

IX

The "Open Formula Act" by its terms was to take effect on August 1, 1936. Between the passage of the Act in May, 1936 and late in July, the fertilizer companies acting largely through their association, held numerous conferences with the Trustees of Clemson College with reference to the enforcement of the new law. These conferences were carried out in a spirit of amity. In late July the fertilizer companies filed the present bill seeking to enjoin the enforcement of the 1936 Amendment by the defendants.

X

The defendants charged with the enforcement of the 1936, as well as the other fertilizer laws, had not at the time of the filing of the bill issued rules and regulations interpreting and applying the 1936 Amendment. The fertilizer com- [fol. 215] panies were, therefore, without the benefit of the views of the administrative officials with respect to the actual application of the new Amendment to their businesses after August 1, 1936.

XI

The defendants being clearly State officers and the bill seeking injunction against the enforcement of the State statute on constitutional grounds, both State and Federal, the case was plainly one to which Section 380, Title 28 U. S. C. A. was applicable, and a Three Judge Court was duly convened for the hearing of the application for Interlocutory Injunction. Interim Order has been agreed to and signed, making the hearing on the application for Interlocutory Injunction a hearing on the final merits also, so that the case is now ripe for decision both as to the application for Interlocutory Injunction and for final decision on its merits.

Findings of Fact as to the Reasonableness of the Regulations Contained in the 1936 Amendment, and as to Its Relations to the Purpose of the Amendment

I

Agriculture is the chief industry of the State of South Carolina and the industry from which the major portion of the people throughout the entire State derive their livelihood. Since the days when the Indians placed a dead fish in each hill of corn, the use of artificial fertilizer to supply plant food to the crops of South Carolina has been a common practice. The use of what is known as commercial fertilizer; that is, fertilizer manufactured in large quantities and sold in the ordinary channels of trade to the farmers is recognized as a large and necessary adjunct to the agriculture of South Carolina.

II

Without going into extensive detail, it is a matter of common knowledge and well supported by the testimony in the instant case that the three major plant foods which can be conveyed by the carriers to the growing crop are phos- [fol. 216] phoric acid (containing phosphorus, the ultimate element of value), ammonia or nitrates (containing nitrogen as the ultimate element of value) and potash (containing potassium as the ultimate element of value). The manufacturers have sought to get these needed plant foods from many different sources. Obviously if any one of the major plant food elements could only be obtained from one source the price of this source or material would be greatly increased and the resulting price of fertilizer to the consumer would finally become prohibitive. For example, the needed nitrogen can be obtained from many sources, the more common are nitrate of soda, a natural mineral product, cotton seed meal, tankage and various side products from packing houses and other manufacturers. In the last few years another common source of nitrogen has come into use and this is a very cheap source of the needed nitrogen. The material cyanamide is obtained by an eletrolytic process from the air. The available nitrogen when obtained by electrolysis is absorbed by some common nitrogen carrier and thus made available for final use in the mixture of commercial fertilizer. The importance of knowledge

with respect to the use of cyanamide is clearly seen when we consider the testimony of the witnesses with respect thereto.

III

There grew up a strong distrust of cyanamide as a source of nitrogen supply and this distrust, probably founded in misapprehension is common to the entire agriculture population of South Carolina. When first used in South Carolina cyanamide was not intelligently used in many cases and damage actually resulted from its use. As a result of experiments, the reason for this damage has been disclosed and the contention of the fertilizer companies now is that cyanamide when properly used as a source of nitrogen is never harmful but beneficial only.

IV

Observation and the sciences of botany, horticulture and agronomy agree with common sense in the conclusion that nitrogen obtained from the different sources does not [fol. 217] always produce the same effect upon the growing crops. Extreme illustrations are cited, nitrate of soda containing 18 per cent nitrogen is a source which is rather expensive but is highly soluble and becomes almost immediately available as food supply to the growing plant; cotton seed meal is a common source of nitrogen supply and is relatively expensive due to the many other uses which this valuable product has, contains on the average of 7 per cent of nitrogen. The nitrogen in this carrier, however, is not nearly so quickly soluble and falls into the classification of available non-soluble carrier of nitrogen. Manifestly, therefore, it is important to the farmer to know whether the 3 per cent nitrogen contained in his final mixture is derived from the use of a large quantity of the 7 per cent cotton seed meal or from the use of a small quantity of 18 per cent nitrate of soda. The law before the 1936 Amendment allowed the fertilizer company to merely use the generic terms nitrate soda or cotton seed meal, without revealing the poundage of each source as actually used in the mixture.

V

According to the testimony of the agronomists and to common sense, there are times when the intelligent farmer

wishes to have his ammonia which produces growth of the plant itself is a quickly available form. There are other times when he wishes to have the nitrogen supplied more tardily to the growing plant, accidents of weather and soil conditions control his decision. Simply to know that his 3 per cent of nitrogen comes from a combination of nitrate of soda and cotton seed meal is not sufficient to guide him in making the wisest decision (possible under the teachings of agronomists and experience) in determining what fertilizer to apply to a particular crop at a particular time.

VI

With the foregoing illustration of the application of the requirements of the new law to the actual facts of agriculture, we have no hesitation in finding as a fact that the [fol. 218] requirements of the 1936 Amendment do most positively tend to meet an actually existing need and to serve the purpose which the Legislature clearly had in mind; namely, to so regulate the fertilizer business as to give the farmer that information which would tend to aid in the carrying on of the major industry of the State of South Carolina.

VII

The facts with reference to the major plant food of potash, containing the ultimate element potassium, as revealed both in the testimony of the scientists and the practical farmers supports our conclusion as to the tendency of the requirements to meet an existing need and to serve a stated purpose even more strongly.

VIII

Potash tends to prevent what is known in the agricultural world as "frenching." The testimony of the agronomists shows that if the plant is pushed by a large quantity of nitrogen and the nitrogen becomes exhausted or dry weather sets in the growing plant will wilt or turn brown around the edges. According to the testimony and common experience, it is abundantly proven that potash is the element needed by the plant to prevent this frenching.

IX

So well known has been this use of potash that some sections of the State were thought to be unavailable for the

growing of certain crops but it was found that the use of a small amount of German kainit on these lands removed the difficulty and they are now among the most productive cotton lands in the State. This truth has been derived as a result of experiments by the farmers themselves, experiments by Clemson College and the scientific studies carried on by the fertilizer companies themselves. The source from which potash is obtained has been found to make considerable difference in its practical effect upon the growing crops. There are sections of South Carolina where the soil is largely of the type popularly known as "black jacks," a type of soil with a considerable portion of gravel and [fol. 219] brownish clay therein. It has been established by experience that no other form of potash is so beneficial to this type of soil as potash when brought to the plant in the form of German kainit.

X

During the war when the source of German kainit was cut off, many other sources of potash were resorted to to supply the needed potash in a very acceptable form to certain plants on certain soils, but for the "black jacks" section when used to produce cotton and corn, no other source of potash was found which was as beneficial as German kainit.

XI

Nitrate of soda, while primarily a nitrogen carrier, contains some potash and hence potash as revealed in the analysis of a mixed fertilizer may have come in some part from the nitrate of soda used primarily to supply nitrogen.

Likewise, cotton seed meal, a carrier used primarily for the supply of nitrogen contains some potash and hence may be in part the source from which potash shown in the final mixture is partly derived.

XII

With reference to the supply of potash, abundantly sustained by the evidence, scientific and practical, this Court finds that the requirement of the law that the source of potash be revealed has a definite and practical tendency to meet an existing need on the part of the purchasers of

mixed fertilizers and tends in a substantial way to carry out the purpose of the Legislature in passing the statute.

XIII

The above illustrations with respect to the nitrogen and potash carrier apply also, though perhaps in a less important way to the sources supplying phosphoric acid as a needed plant food element in mixed fertilizers.

[fol. 220]

XIV

Through many media the farmers of South Carolina are sufficiently informed as to the use of different plant food carriers to make intelligent use of the information required to be disclosed by the Open Formula Act. The farmers themselves have learned by experience. They have consulted with County Farm Agents and special Agents sent out by Clemson College as to the needs of their particular farms. They have numerous bulletins supplied to them dealing with the fertilizer experiments as carried on by Clemson College. They have observed the actual experiments themselves carried on in all sections of the State, and, therefore, carried on on all types of soil similar to the particular soils on which they are growing their particular crops.

XV

The major crops of the State, cotton, tobacco, corn, smaller grains and forage crops each have varying requirements as to the supply of major plant food elements.

XVI

To aid the farmers in the intelligent use of the information disclosed by the Open Formula Act the State and Federal Governments both have made soil maps and soil analyses. The farmer with a stated analysis of his own soil can make intelligent choice of the source from which he wishes to obtain the nitrogen to be used as a plant food for his growing crop. The same is true with respect to his choice of the sources from which the phosphoric acid and potash desired are to be obtained.

XVII

Soils are commonly known to be of acid or non-acid types. To counteract soil acidity dolomitic limestone is commonly used. Certain rare elements, especially magnesia, commonly carried in limestone has a very definite non-acid effect. This value of magnesia is well enough understood by many farmers to make its disclosure of definite advantage. In addition to supplying plant food the effect on the acid condition of the soil of several rare elements is of importance to the farmer.

Finding of Fact as to Amount in Controversy

XVIII

The amount in controversy exceeds Three Thousand Dollars ($3,000.00) exclusive of interest and costs and the jurisdictional requirement so far as Amount in controversy is concerned is therefore satisfied.

Findings of Fact as to the Possibility of Supplying the Information Required by the Act in an Honest and Reasonably Accurate Manner, and Further Findings as to the Increased Cost of Manufacturing and Marketing Which Will Result from Observance of the Requirements of the Act

As introductory to this group of Findings of Fact, we call attention to the fact that the 1936 Amendment requires [fol. 221] the information to be furnished "for each 100 pounds." We further point out that one of the main attacks made by the fertilizer companies is that an honest compliance with this provision of the statute will be practically a physical impossibility. They contend that any attempted compliance without keeping records prohibitive by reason of the volume requirement would be a plain subterfuge; that the result, therefore, would be that the information given by the disclosure would be so unreliable as to be of no value to the purchasers. The complainants contend that the only alternative to this is to mix practically a separate physical mixing of every few tons and to keep elaborate records as to the materials put into each small pile of fertilizer. That the practical alternative of following this alternative would be to so enlarge the warehouses

and manufacturing plants as to make the cost absolutely prohibitive. With this brief statement of the complainants' contentions on this phase of the case, we make the following findings of fact thereabout.

I

While the Clemson authorities charged with the enforcement of the Act have not published their rules and regulations pursuant thereto, the presumption is that such rules and regulations will be reasonable and will in spirit and tenor be in keeping with the regulations heretofore made by the same body in enforcing other statutes relating to the fertilizer business. The testimony abundantly sustains the conclusion that such a course has been followed in the past and justifies the prophecy that it will be continued.

II

The word "mixture" has under the testimony come to have a rather definite meaning in the fertilizer business. It relates not so much to the finished product in the sack as it does to the actual pile of fertilizer as mixed in the manufacturing plant and left to cure before being finally ground up and put into sacks. The testimony deals fully with the actual processes followed in the mixing of the fertilizer, and the greater weight of the testimony suggests that the aver- [fol. 222] age unit of mixture as actually made by the larger fertilizer companies when making a typical fertilizer for sale in large quantities is about five thousand tons. Under the testimony we find that in some cases a strict compliance with the statute will probably call for a large warehouse and the inauguration of a more elaborate system of bookkeeping as to the exact materials put into each mixture but these increased expenses will not be so great as to render the cost of the manufacture of the finished product prohibitive and out of line with the probable increase of prices which the actual trade would bear. See Note.*

* NOTE.—This Finding of Fact has a definite bearing upon a subsequent conclusion of law wherein we point out that this balance of increased costs against the resulting benefit is a question for the Legislature and not for the Courts.

III

Assuming that the Board charged with the enforcement of the 1936 Amendment and that the Supreme Court of South Carolina, having the final authority to construe the meaning of the terms used in the Amendment, will construe this phase of the statute in a reasonable way with the actual facts of the manufactur- in mind, we find as a fact that under such construction the requirements of the statute do not put any unreasonable, arbitrary and baseless increase of costs of manufacture upon the fertilizer companies. We find further that honest compliance with the statute will probably result in the keeping of records for smaller mixtures of fertilizer than has been the practice heretofore; that such increased keeping of records will not be unreasonable, arbitrary and baseless.

IV

In connection with the foregoing finding of fact, we find that the actual practice of dumping the mixture of a small quantity called a batch on "the pile" is done in such a way as to result in the distribution of small quantities from each mixture in every direction on the pile. See in this connection the testimony of witness Garrity on page 140 of the [fol. 223] typewritten record. The mixture falls upon a cone shaped pile rather than falling vertically into one corner of a rectangular container. The method as actually followed results in a practically uniform composition in every part of the resulting pile of fertilizer. The mixing thus distributes part of each small mixture throughout the entire pile, and each small mixture is not confined as a matter of actual practice to one corner of the resulting pile from which the final mixture is put into the sacks for sale.

V

The extra bookkeeping required by even the strictest compliance with the 1936 Amendment is nothing new in the fertilizer business. A well defined practice has been going on for years which requires this extra work and expense. Individual farmers, particularly the larger and more intelligent ones, have for years been calling upon the companies to manufacture for them a mixture according to a particular formula named by themselves. The purchasing

farmer knowing his own land and believing that a particular mixture coming from a particular source will be most beneficial to his crops submits his formula to the company, the company then mixes up the mixture to meet the requirements of this particular purchaser.

So far as the effect of the 1936 Amendment on expenses and record keeping is concerned the result is simply to require the fertilizer companies to do for every purchaser what they have been doing for special purchasers for a number of years. The small extra charge for this extra service has been extremely moderate and there is no reason why the same small extra charge would not take care of the extra costs and expenses resulting from the following of this practice with respect to all of the fertilizer manufactured by a given company. The testimony shows that these costs range from 50¢ per ton to $2.50 per ton. Such compensation has actually offset the extra expenses and trouble in the past, and the only reasonable conclusion is [fol. 224] that approximately the same extra charge will effect the increased costs and trouble in the future.

Findings of Fact as to the Meanings of the Technical Terms Used in the Statutes Involved in This Case

I

The testimony shows that certain technical terms have by actual use come to have rather definite meanings, and these meanings as listed below are the meanings which we find that the terms have so far as they are involved in this case.

Commercial Fertilizers.—A statutory definition of this term is given by Section 6372 of the Code of Laws of South Carolina, 1932.

Mixtures.—This word is used in two senses in the fertilizer trade. In the first place it is used to describe the fertilizer as it actually exists immediately after coming out of the mixing machinery and just before it is transported to the storage or curing piles. The other common use of the word, and that which we have used chiefly in our Findings of Fact, describes the fertilizer as it is finally prepared after curing and storing, and as it is actually poured into sacks for shipment and sale.

There was introduced in evidence a dictionary of ferti-

lizer materials. This dictionary shows the commonly accepted meaning of all of the technical words used in the fertilizer trade. We are content with the definitions contained in this dictionary entitled "A Dictionary of Fertilizer Materials", copyrighted 1927, Ware Bros. Company, Philadelphia, compiled by H. C. Moore, Chicago, Illinois. With the exception, however of the word "Analysis" as it appears in the Amendment. This we think requires special definition and discussion by us and so we make a separate finding of fact as to this word.

Finding of Fact as to the Meaning of the Word Analysis as Used in the Amendment under Consideration Together with Supporting Discussion

[fol. 225] The section complained of reads as follows:

"'(b) That the amount and *analysis* of each material, or source, of each plant food element used in manufacture, of a fertilizer mixture containing two or more plant food elements be stated on a tag attached to each sack or container, such amounts of materials to be stated in pounds per hundred pounds of mixture contained in the sack or other container. This statement of pounds of material used in the manufacture, of a fertilizer mixture shall be in addition to the statement of chemical analysis as required by Section No. 6366 of the Code of Laws of South Carolina.'" (Italics ours.)

The construction of the word "analysis" as it appears therein is highly important in determin-g whether or not the enforcement of the statute can be carried out in a reasonable way. To construe the word analysis in a strict dictionary sense would be plainly inadequate. If the word analysis is given a technical construction and the science controlling the technical construction is that of analytical chemistry, we will then have the construction which the complainants contend will render the enforcement of the statute so difficult and visionary as to be wholly impractical. If this meaning of the word analysis is taken, then instead of one tag showing the analysis so far as the main facts are concerned, both the three major plant foods and the rare elements known to be of any value at all, we would have a sub-analysis showing the chemical formula for each

of the carriers used in the manufacture of the particular fertilizer involved. This, we think, would be such an absurd result and put such additional burden upon the manufacturers, with no corresponding benefit to the purchasing farmers, as to be unreasonable. We refuse to adopt this meaning of the word "analysis" in our construction of the statute. The word "analysis" must be construed, we think, in the light of its use in the fertilizer business and in statutes governing the fertilizer business which are already on the books. We, therefore, have found as a fact that the analysis required in the sentence "That the amount and analysis of each material, or source, of each plant food element used in the manufacture of a fertilizer mixture • • •" means that the major carrier shall be given, the [fol. 226] percentage per hundred pounds of this major carrier be given, and that the analysis of this major carrier, so far as it contains any of the well recognized plant food elements (major or minor, when important, common or rare in occurrence) be stated. For example, many of the major plant food carriers will contain a large percentage of carbon, an ultimate element, but neither the fertilizer company, the enforcing agency nor the purchasing farmer is interested in the amount of carbon contained in a major carrier used for the purpose of providing phosphoric acid, ammonia or potash in a given mixture. For further example, one of the common sources of nitrogen is tankage, we do not understand that this law when reasonably interpreted would require the analysis from a chemical standpoint of the tankage and then a sub-analysis of every material which went into the tankage. This construction of the word analysis is extremely important in our consideration of the case; indeed were we not making such a construction of this word, our view of the whole case might be changed.

This finding of fact as to the meaning of the word analysis as here used is, we think, substantiated by well known principles of statutory construction with which we deal in detail in our opinion. This construction is further substantiated by the fact that in the closing words of the Section the information required is said to be in addition to the chemical analysis required by Section 6366 of the Act. Although the word "chemical" is there used the enforcing agencies, enforcing Section 6366, have only required analysis of the final mixture which shows the presence and percentage of

the plant foods present. If such is the construction of the phrase "chemical analysis" as actually applied a fortiori, such a limited construction should be put upon the word "analysis" when used without the adjective "chemical". How can it be said that the Legislature meant to require more when they used the simple word analysis than the administrative agencies, charged with the enforcement of the previous Act, had understood them to mean when they used the stronger phrase chemical analysis? We have, therefore, found as a fact that the word "analysis" as used in the Amendment has this reasonable meaning and that compliance with such a reasonable construction will mean compliance with the Statute. This finding of fact is [fol. 227] essential and well nigh controlling factor in our ultimate decision of the case as a whole.

We find that the word "analysis" as defined in the dictionary referred to above is as follows:

"The word 'analysis' as applied to fertilizer, shall designate the percentage composition of the product expressed in terms of nitrogen or ammonia, phosphoric acid and potash in their various forms.' (Definition submitted by the Committee on Definitions of Terms and interpretations of Results on Fertilizers accepted for final adoption by the A. O. A. C., October, 1926.)"

We think, however, that as used in this Statute there should be another sentence added as follows:

"The analysis shall also designate the source or sources of the nitrogen or ammonia, phosphoric acid and potash, and with respect to the ammonia shall give full information as to solubility or insolubility."

These foregoing elements constitute the meaning of the word "analysis" as we find it to be now understood in the South Carolina laws with reference to commercial fertilizers. The force and effect of the Amendment now under consideration is simply to add to this analysis a quantitative statement showing the relative proportion of the various sources which are mixed together to form the final mixture of fertilizer. For the purpose of such statement, the unit of one hundred pounds is named in the statute.

Additional Finding of Fact as to Super-Phosphates

Super-phosphate is a product resulting from a mixture of finely ground phosphate rock with sulphuric acid. Phosphate rock produced mainly in Florida is shipped to the factories, ground into a very fine powder and then treated with sulphuric acid. These treatments are usually made in one ton batches. These batches are then cured over a period varying from one to six months, the result is a highly uniform mixture containing acid in a highly available form. Super-phosphate in its final form contains 16% to 21% available phosphoric acid.

Meaning of the Word "Source"

So closely allied with and necessary to an understanding of the meaning of the word "analysis" is the meaning of the word "source" that it demands separate treatment. [fol. 228] The dictionary as introduced in evidence does not define this important word and, therefore, we find it necessary to make and declare our own definition of this word so important in this statute. Source as used in the statute means that substance which is used in the making of a fertilizer mixture in order to get into the final mixture one or more of the important plant food elements necessary to and desirable for the efficiency and suitability of the final mixture. For example, cotton seed meal is a composite substance (not a final chemical element) which contains in a definite and available way a certain amount of nitrogen. Cotton seed meal is, therefore, said to be and is one of the common sources of nitrogen content in commercial fertilizer.

Findings of Fact as to Trade Marks, Trade Names and Secret Formulæ

I

Introductory Statement.—Under the view which we take of the law applicable to this case, it is not necessary to a decision thereof to decide exactly what the legal status of the plaintiffs' title to trade marks, trade names of special brands or secret formulæ are. We have found in our Conclusions of Law that whatever rights the plaintiffs may

have to these trade names, trade marks and secret formulæ, these rights are subordinate to and limited by the reasonable exercise of the police power of the sovereign State of South Carolina.

Nevertheless, we think in fairness to the plaintiffs it is proper to set forth our Findings of Fact with reference to this matter.

II

There has been a constant progress in the science of the fertilizer manufacture and use. Farmers with practical experience, agronomists, chemists, agricultural colleges and the Department of Agriculture have all made substantial contributions to this progress. Nevertheless, the fertilizer companies themselves have through experiments in cooperation with farmers, through chemical research and through [fol. 229] the tabulation of results obtained from their own experiences, contributed in a substantial way to this progress. As testified to in this case, many of the larger companies have spent many thousands of dollars in research and experiments. We find as a fact, therefore, that while the fertilizer companies, complainants herein, have not been responsible for all of the progress in the science of fertilizer manufacture and use, nevertheless, they have contributed thereto in a most substantial and definite way. But, we further find as a fact that they have also profited in a substantial and definite way from the revelations made by the various agencies referred to above.

III

Several of the complainants have developed particular brands of fertilizer to which trade names have been applied and these trade names, as the "Rainbow" brand, have been so well advertised and are so well known in the trade as to acquire substantial value. The substantial values of these trade names, if under direct scrutiny in a suit involving the-r existence and value would in all probability be found to be entitled to legal protection. But the legal existence of such trade names in such a suit and the exact nature and extent of the rights arising therefrom are questions which are not necessary to the decision of this case and, therefore, we make no further elaboration of the facts thereabout.

IV

The reputation for honest manufacture and quality of goods of several of the larger companies and many of the smaller companies has built up a trade of great value for each of these companies. As said above, the exact legal nature and value of these trade names are not questions necessary for the decision of this case and, therefore, are not further discussed.

V

Many of the plaintiff companies have kept secret the [fol. 230] formulæ which they use in manufacturing their respective brands of fertilizer. These formulæ have never been completely secret as revelation of some parts of the formulæ has already been compelled by existing statute and regulation. The 1936 Amendment complained of in this suit will compel further and material disclosure of parts of these secret formulæ. We have held in our conclusions of law that such compelled disclosure is a reasonable exercise of the police power of the sovereign State of South Carolina and, therefore, the rights of the plaintiffs to these secret formulæ are subordinate to and controlled by such exercise of the police power.

VI

We find that the rights of several of the plaintiff companies in and to these secret formulæ, to their trade names and to the trade marks with respect to several particular brands are definitely enough shown to amount to property rights under the laws of the State of South Carolina and of the United States. As we have repeatedly said, however, our views with reference to the exact nature and extent of these property rights are not necessary to the decision of this case, and we, therefore, do not elaborate our findings of fact with respect thereto.

(Signed) John J. Parker, United States Circuit Judge.

December 5th, 1936.

(Signed) H. H. Watkins, United States District Judge.

December 8th, 1936.

(Signed) J. Lyles Glenn, United States District Judge.

December 4th, 1936.

[fol. 231] IN UNITED STATES DISTRICT COURT

[Title omitted]

CONCLUSIONS OF LAW—Filed Dec. 9, 1936

I

The plaintiffs are not entitled to the relief sought in their Bill and the whole matter having been heard and full testimony having been taken, arguments had and every factual showing and legal contention being fully considered, the defendants are entitled to have the Bill dismissed on its merits.

II

The plaintiffs are not entitled to the Interlocutory Injunction which they have applied for.

III

The plaintiffs are not entitled to the Permanent Injunction for which they have prayed in their prayer, but on the contrary the defendants are entitled to a Decree denying this Permanent Injunction on the merits of the case.

IV

This case has been heard by a Court of competent jurisdiction, sitting as a District Court of Three Judges convened under Section 380, Title 28 U. S. C. A., for the Western [fol. 232] District of South Carolina. This Court has jurisdiction of the entire suit both as to parties and subject matter.

V

The 1936 Amendment to the fertilizer laws of South Carolina, reading as follows:

"(b) That the amount and analysis of each material, or source, of each plant food element used in manufacture, of a fertilizer mixture containing two or more plant food elements be stated on a tag attached to each sack or container, such amounts of materials to be stated in pounds per hundred pounds of mixture contained in the sack or other container. This statement of pounds of materials used in the manufacture of a fertilizer mixture shall be in addition to

the statement of chemical analysis as required by Section 6366 of the Code of Laws of South Carolina, 1932."

is within the police power of the State of South Carolina. It is a valid and reasonable exercise of such police power, and the force and effect of such Amendment tends in a reasonable way to effect the object sought to be accomplished by the Amendment.

VI

The rights of the plaintiffs herein to their respective trade names, trade marks and secret formulæ are all subject to, and subordinate to the control by the aforesaid valid and reasonable exercise of the police power of the State of South Carolina.

VII

The disclosures and revelations compelled by the Amendment are reasonably necessary for the accomplishment of the purpose sought to be accomplished by the Amendment and all reasonably tend to accomplish this purpose. The necessity for such disclosures as are compelled by the Amendment has a reasonable basis in the facts as we have found them to exist. The balancing of the inconvenience and expense of such control against the benefits is primarily a question for the Legislature and not for this Court.

VIII

The Amendment, reasonably construed, as we find that it must be construed by the administrative agencies charged [fol. 233] with its enforcement is neither arbitrary, unreasonable nor capricious.

IX

The Amendment as reasonably construed by this Court and as this Court is compelled, under applicable principles of law, to presume that it will be construed and applied by the enforcing agencies is susceptible of being complied with in an honest and reasonably accurate manner. Such reasonable and honest regulation and resulting compliance will not impose such an unreasonable expense or hardship upon the manufacturing and selling companies as to amount to unreasonable control as a matter of law.

X

The Amendment as reasonably construed by this Court and as this Court is compelled, under applicable principles of law, to presume that it will be construed and applied by the enforcing agencies is susceptible of being complied with in an honest and reasonably accurate manner and, therefore, does not amount to the taking of property of the complainants without due process of law and does not, therefore, violate the due process clause of the Fourteenth Amendment to the Constitution of the United States.

XI

This Amendment to the fertilizer laws of the State of South Carolina as reasonably construed by this Court and as this Court is compelled, under applicable principles of law, to presume that it will be construed and applied by the enforcing agencies is susceptible of being complied with in an honest and reasonably accurate manner and, therefore, violates none of the constitutional provisions of either the Constitution of the United State- or of the State of South Carolina, which have been relied on by the plaintiffs in their bill as rendering the aforesaid Amendment uncon- [fol. 234] stitutional under *under* Federal and State Constitutions.

(Signed) John J. Parker, United States Circuit Judge.

December 5th, 1936.

(Signed) H. H. Watkins, United States District Judge.

December 8th, 1936.

(Signed) J. Lyles Glenn, United States District Judge.

December 4th, 1936.

[fol. 235] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT FOR THE WESTERN DISTRICT OF SOUTH CAROLINA

In Equity

THE NATIONAL FERTILIZER ASSOCIATION, INC., ACME MANUFACTURING CO., Aiken Fertilizer Co., (J. D. Prothro,

Owner), The American Agricultural Chemical Co., Anderson Fertilizer Co., Inc., Armour Fertilizer Works, Banks Fertilizer Co., (a Partnership Composed of Mrs. M. L. Banks, D. H. Banks, M. H. Banks, J. A. Banks, Jr., R. W. Banks and B. C. Banks), Blue Belt Fertilizer Co., Catawba Fertilizer Co., Chatham Chemical Co., The Davison Chemical Corp., Empire State Chemical Co., Inc., Etheredge Guano Co. (J. Lee Etheredge, Owner), Etiwan Fertilizer Co., Farmers Fertilizer Co., Fountain Inn Mixing Co., (J. A. Barry, Owner), The Hartsville Fertilizer Co., Holly Hill Fertilizer Co., International Agricultural Corp., Logan-Robinson Fertilizer Co., Maybank Fertilizer Corp., W. F. McLees, Merchants Fertilizer Co., Molony Fertilizer Co., Mutual Fertilizer Co., Nitrate Agencies Co., Pearsall & Co., Pendleton Oil Mill, Planters Fertilizer & Phosphate Co., Reed Phosphate Co., Reliance Fertilizer Co., F. S. Royster Guano Co., Smith-Wilkinson Guano Co. Inc., Southern Agricultural Chemical Corp., The Southern Cotton Oil Co., Southern Fertilizer & Chemical Co., Southern States Phosphate & Fertilizer Co., Swift & Company Fertilizer Works, Union Oil Mill, Virginia-Carolina Chemical Corp., Wingard Fertilizer Co., Charles P. Wray & Co. (a Partnership Composed of A. B. Heins and J. S. Edmunds), Plaintiffs,

against

W. W. Bradley, Individually and as Chairman of the Board of Trustees of Clemson Agricultural College, A. F. Lever, J. E. Sirrine, Paul Sanders, Christie Benet, T. B. Young, R. M. Cooper, B. T. Leppard, Edgar A. Brown, Sam H. Sherard, J. B. Douthit, F. E. Cope and W. D. Barnett, Individually and as Members of the Board of Directors of the Clemson Agricultural College, and John M. Daniel, Individually and as Attorney General of the State of South Carolina, Defendants

Final Decree—Filed December 9, 1936

For the reasons set forth in the Findings of Fact, the Conclusions of Law and the separate Opinion filed herewith, the plaintiffs are not entitled to the relief sought in their bill.

It is, therefore, ordered, adjudged and decreed:

I

That the bill be, and the same is hereby dismissed and the relief sought therein be, and the same is hereby, denied.

[fol. 236] II

That the Interlocutory Injunction applied for and sought by the plaintiffs herein be, and the same is hereby, denied by the Court properly constituted to hear such application.

III

That the Permanent Injunction against the enforcement by the defendants of the 1936 Amendment to the fertilizer laws of South Carolina be, and the same is hereby, denied. This Amendment reads as follows:

"(b) That the amount and analysis of each material, or source, of each plant food element used in manufacture, of a fertilizer mixture containing two or more plant food elements be stated on a tag attached to each sack or container, such amounts of materials to be stated in pounds per hundred pounds of mixture contained in the sack or other container. This statement of pounds of materials used in the manufacture, of a fertilizer mixture shall be in addition to the statement of chemical analysis as required by Section No. 6366 of the Code of Laws of South Carolina, 1932."

being an Act amending Section 6367, Code of Laws of South Carolina, 1932.

(Signed) John J. Parker, United States Circuit Judge.

December 5th, 1936.

(Signed) H. H. Watkins, United States District Judge.

December 8th, 1936.

(Signed) J. Lyles Glenn, United States District Judge.

December 4th, 1936.

[fol. 237] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

PETITION FOR APPEAL AND PRAYER FOR REVERSAL—Filed December 14, 1936

Considering themselves aggrieved by the decision and decree of the Court of Three Judges convened in the above entitled case pursuant to section 266 (U. S. Code Annotated, Title 28, Sec. 380) of the Judicial Code, the plaintiffs herein hereby pray that an appeal be allowed to the Supreme Court of the United States herein, and that the decree of the District Court of the United States for the Western District of South Carolina dated December 9, 1936, in the above entitled cause be reversed and a decree rendered in favor of the said plaintiffs and for costs.

W. C. McLain, Solicitor for Plaintiffs.

[fol. 238] IN UNITED STATES DISTRICT COURT

Order Allowing Appeal

And now, to wit, on December 14th, 1936, it is ordered that the appeal be allowed as prayed for upon the filing of bond in the sum of $250, in accordance with the rule of the District Court.

(Signed) J. Lyles Glenn, U. S. District Judge.

[fol. 239] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

RESTRAINING ORDER PENDING APPEAL TO THE SUPREME COURT —Filed December 23, 1936

A final decree was entered in this case dismissing the Bill and denying the application for interlocutory injunction and permanent injunction. This final decree was filed in the office of the Clerk of Court of the above District on December 9, 1936. The case had been heard by a Court of three Judges convened under the terms of Section 380, Title 28

U. S. C. A. The plaintiffs have filed their petition for appeal and the appeal has been allowed, all in compliance with the applicable statutes and rules of Court. They now make application to this Court for a restraining order pending appeal. After due consideration of the application and for reasons good and sufficient to the Court, the Court is of the opinion that a restraining order should be allowed pending the appeal to the Supreme Court of the United States.

It is, Therefore, Ordered, Adjudged and Decreed that the defendants herein, their agents and servants be, and they are hereby temporarily restrained and enjoined from in any way enforcing against the plaintiffs the provisions of the statutes referred to in the Bill of Complaint this statute being an amendment to Section 6367 of the Code of Laws of [fol. 240] South Carolina 1932, and being an Act of the General Assembly of South Carolina, No. 728, 1936, and being duly approved by the Governor on the 6th day of April, 1936, Statutes of South Carolina 1936, page 1400. That this restraining order be, and the same is conditioned, however, upon the following conditions:

1. Upon the condition that the plaintiffs herein file with the Clerk of this Court a good and sufficient appeal bond, to be approved by one of the undersigned Judges within ten (10) days from the filing of this order.

2. That the plaintiffs herein do proceed to perfect the allowed appeal in accordance with the applicable rules and statutes with all reasonable diligence and in good faith.

3. That the plaintiffs-appellants do docket the appeal in the Supreme Court of the United States within thirty (30) days from the date of the filing of this Order in the office of the Clerk of Court for the Western District of South Carolina.

(Signed) John J. Parker, United States Circuit Judge.

December 17th, 1936.

(Signed) H. H. Watkins, United States District Judge.

December 18, 1936.

(Signed) J. Lyles Glenn, United States District Judge.

December 14th, 1936.

[fol. 241] IN UNITED STATES DISTRICT COURT

[Title omitted]

ACCEPTANCE OF SERVICE OF RESTRAINING ORDER PENDING APPEAL TO THE SUPREME COURT—Filed Dec. 28, 1936

Service of the Restraining Order Pending Appeal to the Supreme Court is hereby accepted this 24th day of December, 1936.

John M. Daniel, J. Ivey Humphrey, Harold Major,
Attorneys for the Defendants.

[File endorsement omitted.]

[fols. 242-243] Citation in usual form, showing service on John M. Daniel et al., filed Dec. 15, 1936, omitted in printing.

[fol. 244] [File endorsement omitted]

SUPREME COURT OF THE UNITED STATES

[Title omitted]

[fol. 245] ASSIGNMENTS OF ERROR—Filed Jan. 19, 1937

Come now the plaintiffs and assign the following errors in the records and proceedings in said case:

1. The Court erred in finding that the South Carolina Fertilizer Law, prior to the challenged amendment, "required manufacturers and sellers of fertilizer to reveal by a tag attached to the sacks the analysis of the fertilizer contained in the sacks", for the reason that that law required in that respect only a statement by the seller of "the minimum percentage only guaranteed to be present of available phosphoric acid, of nitrogen (ammonia equivalent), and of potash soluble in water"—the three major plant foods. (F. F. H. III, p. 2. See Code, sec. 6366.)

2. The Court erred in finding: "The analysis which has been shown on the tag before the passage of the 1936 amendment (hereinafter referred to) has disclosed the percentage of the amount of plant food elements used in the manufacture", for the reason that the law prior to the 1936 amendment required that the tags show, not "the percent-

age of the amount of plant food elements *used*", but the minimum guaranteed percentage of the major plant food elements contained in the bag of fertilizer. (F. F. H. IV, p. 3. See Code, sec. 6366.)

3. The Court erred in finding: "The analysis which has been shown on the tag before the passage of the 1936 amendment (hereinafter referred to) has disclosed the percentage of the amount of plant food elements used in the manufacture. • • • Several years ago the law was amended so as to require the fertilizer to show not only the [fol. 246] percentage of each major plant food contained in the mixture but to reveal the source from which each such major plant food is derived", for the reason that the law was not so amended, but was amended so as to require such information to be shown on the bag or on a tag attached thereto with respect to ammonia but not with respect either to phosphoric acid or to potash, the other two "main plant food elements." (F. F. H. IV, p. 3. See Code, sec. 6367.)

4. The Court erred in stating the language of the 1936 amendment as follows: "• • • (b) That the amount and analysis of each material, or source, of each plant food element used in manufacture, of a fertilizer mixture containing two or more plant food elements be stated on a tag attached to each sack or container", in that the Court omitted the following additional sentence, which is part of the amendment: "This statement of pounds of materials used in the manufacture, of a fertilizer mixture shall be in addition to the statement of chemical analysis as required by Section No. 6366 of the Code of Laws of South Carolina, 1932." (F. F. H. VI, p. 4.)

5. The Court erred in finding that an "8-3-3" mixture is a brand of fertilizer, because the record shows that the figures "8-3-3" designate a "grade", not a "brand", of fertilizer and that there is an important difference between the meanings of the two words. (F. F. H. VIII, p. 4.)

6. The Court erred in defining an "8-3-3" mixture of fertilizer as follows: "In fertilizer language this means that the final mixture as analyzed by the chemist at the end of the process of manufacturing and mixing contains three major plant food elements in the following proportions: 8 [fol. 247] per cent phosphoric acid; 3 per cent nitrogen and

3 per cent potash", whereas, the record shows that an accurate definition would be: "In fertilizer language this means that the mixture as offered for sale is *guaranteed* by the seller to contain *not less than* 8 per cent *available* phosphoric acid, 3 per cent *ammonia* and 3 per cent potash *soluble in water.*" (F. F. H. VIII, p. 4. See Code, sec. 6366.)

7. The Court erred in finding, in connection with its definition of an "8-3-3" mixture of fertilizer: "In addition to this bald statement of the percentage analysis, the law had previously required the manufacturer to state from what source the 8 per cent phosphoric acid was derived. Likewise the sources of the nitrogen and potash were required to be stated. For example, phosphate rock as dissolved by mixture with sulphuric acid is a common basis of phosphoric acid as used in fertilizer. If the 8 per cent of phosphoric acid as contained in the final mixture comes from this source, a bald statement that the source was 'Super-Phosphate' met the requirements of the statute," for the reason that the law did not require the manufacturer to state on a tag or bag the source of the phosphoric acid or of the potash, but only of the ammonia. (F. F. H. VIII, p. 4. See Code sec. 6367.)

8. The Court erred in construing the 1936 amendment (the Open Formula Act) to require that the source of each major plant food element and the analysis and poundage of each major plant food element only be shown, for the reason that the amendment plainly requires that such disclosure must be made as to each plant food element, whether major or minor. (F. F. H. VIII, p. 5.)

[fol. 248] 9. The Court erred in finding: "Previous to the 1936 amendment (the Open Formula Act) it was sufficient to state that the 3 per cent of nitrogen was obtained from cotton seed meal and nitrate of soda without revealing the poundage of each source used in the mixture", for the reason that the law referred to required in addition a statement on the tag or bag dividing the 3 per cent nitrogen into two classes, namely, water soluble and available water-insoluble nitrogen, and the percentage of nitrogen guaranteed to come from either of these classes, and also the names of the materials from which the nitrogen of each such class was derived. (F. F. H. VIII, p. 5. See Code, sec. 6367.)

10. The Court erred in finding: "The law before the 1936 amendment allowed the fertilizer company to merely use the generic terms nitrate of soda or cotton seed meal, without revealing the poundage of each source as actually used in the mixture", and "Simply to know that his 3 per cent of nitrogen comes from a combination of nitrate of soda and cotton seed meal is not sufficient to guide him (the farmer) in making the widest decision possible under the teachings of agronomists and experience, in determining what fertilizer to apply to a particular crop at a particular time", for the reason that the law prior to the amendment required much more than a statement of "the generic terms" in that it required the tag to show the nitrogen divided into two classes, water soluble and available water-insoluble, the guaranteed percentage of nitrogen of either class, and the sources from which the nitrogen of each such class was derived. (F. F. R. IV and V, p. 8, See Code, sec. 6367.)

11. The Court erred in finding that, in order for the farmer to make an intelligent selection of fertilizer, it is im-[fol. 249] portant for him to know the source of nitrogen (nitrate of soda, cottonseed meal, cyanamid, sulphate of ammonia, etc.), and in failing to find from the record that for such purpose it is important for him to know, not such source, but the class of nitrogen (water soluble, available water-insoluble) contained in the fertilizer. (F. F. R. IV and V, p. 8.)

12. The Court erred in finding that the requirements of the Challenged Act "do most positively tend to meet an actually existing need and to serve the purposes which the legislature clearly had in mind", for the reasons that, as shown by the record, (1) such finding is not justified by the record; (2) the South Carolina fertilizer law without the amendment requires all the disclosures which are necessary for a fertilizer user to have; (3) it is not important for the farmer to know the materials or sources of the plant food elements used in the manufacture of his fertilizer, but it is important for him to know the classes of certain of such elements and a disclosure of this information is required by the South Carolina fertilizer law without the Open Formula Amendment; and (4) in addition under the law without the amendment a farmer can have his fertilizer mixed in accordance with his own formula, thereby having complete in-

formation as to the sources or materials used in its manufacture and the amount and analysis of each, and is protected by a heavy penalty if it is not so manufactured for him. (F. F. R. VI, p. 9. See Code, sec. 6367.)

13. The Court erred in finding: "The facts with reference to the major plant food of potash, containing the ultimate element potassium, as revealed both in the testimony of the scientists and the practical farmers supports our conclusion as to the tendency of the requirements to meet an existing need and to serve a stated purpose even more strongly", for the reason that such finding is not supported by the evidence. (F. F. R. VIII, p. 9.)

[fol. 250] 14. The Court erred in finding that potash tends to prevent "frenching", for the reason that there is nothing in the record to support such finding, nor is it a fact, the evidence in the record being to the effect that it is magnesia, not potash, that tends to prevent "frenching." (F. F. R. VIII, p. 9.)

15. The Court erred in finding, with respect to potash, that "the source from which potash is obtained has been found to make considerable difference in its practical effect upon the growing crops," and that therefore the requirements of the challenged act "do most positively tend to meet an actually existing need and to serve the purpose which the Legislature clearly had in mind"; for the reason that the record shows that (1) the differing effects upon growing crops which follow the use of different carriers (sources) of potash are due, not to any difference in the potash itself, but to elements other than the three major plant food elements, that are contained in such potash carriers, e. g., magnesium contained in "Old German Kainit"; (2) the quantity of such other (minor) elements varies widely even in the same carrier; and (3) therefore under the Court's construction of the word "analysis" which limits its application to the three major plant food elements a disclosure of the source of potash would not serve the purpose which the Court stated that the Legislature had in mind. (F. F. R. VI and IX, p. 9.)

16. The Court erred in finding: "There are sections of South Carolina where the soil is largely of the type popularly known as 'black jacks,' a type of soil with a consider-

able portion of gravel and brownish clay therein. It has been established by experience that no other form of potash is so beneficial to this type of soil as potash when brought to the plant in the form of German kainit * * * but for the 'black jacks' section when used to produce cotton and [fol. 251] corn, no other source of potash was found which was as beneficial as German kainit", for the reason that there is no evidence in the record to support such finding, the evidence as to such soils being merely that they required larger quantities of potash than some other types of soil. (F. F. R. IX and X, p. 10.)

17. The Court erred in finding: "With reference to the supply of potash, abundantly sustained by the evidence, scientific and practical, this Court finds that the requirement of the law that the source of potash be revealed has a definite and practical tendency to meet an existing need on the part of the purchasers of mixed fertilizers and tends in a substantial way to carry out the purpose of the legislature in passing the statute," for the reason that the testimony shows that what is important for the farmer to know is not the source of potash but whether or not certain other elements are present in the potash carrier, which information is not disclosed by a statement of the potash source. (F. F. R. XII, p. 10.)

18. The Court erred in finding: "The above illustrations with respect to the nitrogen and potash carrier apply also, though perhaps in a less important way to the sources supplying phosphoric acid as a needed plant food element in mixed fertilizers," for the reason that there is no testimony in the record showing that knowledge of the source of phosphoric acid is of any importance to a farmer. (F. F. R. XIII, p. 10.)

19. The Court erred in finding that the farmers of South Carolina can make intelligent use of the information required to be disclosed by the Open Formula Act, for the reason that it is fully shown by the record that only in rare cases have farmers exercised their right, under South Carolina fertilizer laws without the open formula amendment, [fol. 252] to have their fertilizers made up according to their own formulas from materials specified by them. (F. F. R. XIV, p. 11.)

20. The Court erred in finding: "To aid the farmers in the intelligent use of the information disclosed by the Open Formula Act the State and Federal Governments both have made soil maps and soil analyses," for the reasons that (1) such finding is not supported by the testimony, (2) the record shows that no other State has an open formula statute, and (3) the Court should have taken notice of the well-known fact that such soil maps and soil analyses were made many years before the passage of the Open Formula Act, and with no relation to such Act or to information such as is required to be disclosed by the Open Formula Act. (F. F. R. XVI, p. 11.)

21. The Court erred in finding that the increased expenses arising from building large warehouses and the inauguration of more elaborate systems of bookkeeping that would be necessitated by compliance with the Act "will not be so great as to render the cost of the manufacture of the finished product prohibitive and out of line with the probable increase of prices which the actual trade would bear," for the reason that such finding is not supported by the evidence, and is not a fact, the evidence showing that the increased expenses that would be necessitated by compliance with the Act would be unreasonable and so great as to render the cost of manufacture of fertilizer so excessive as practically to destroy plaintiffs' business (F. F. P. II, p. 13.)

22. The Court erred in finding that under a predicted construction by the South Carolina Courts of the challenged Act, and under predicted regulations by the State administrative-agencies for its enforcement, the admitted increased cost of manufacture would not be unreasonable, arbitrary [fol. 253] or baseless, for the reasons that (1) since there is no need for the statute, any increased cost makes the statute arbitrary and unreasonable, and (2) such finding is not supported by the record. (F. F. P. III, p. 13.)

23. The Court erred in finding in connection with its description of the process of fertilizer manufacture that the method followed results in a practically uniform composition in every part of the resulting pile of fertilizer, and that the process thus distributes part of each small mixture

throughout the entire pile, for the reason that such a finding is contrary to the testimony and to well-known laws of physics. (F. F. P. IV, p. 14.)

24. The Court erred in finding: "The testimony shows that these costs (for occasional mixing of fertilizer according to a farmer's special formula) range from 50¢ per ton to $2.50 per ton. Such compensation has actually offset the extra expenses and trouble in the past, and the only reasonable conclusion is that approximately the same extra charge will offset the increased costs and trouble in the future," for the reason that such finding is not warranted by the testimony. (F. F. P. V, p. 14.)

25. The Court erred in its findings as to the meaning of the word "analysis" as used in the Open Formula statute, for the reason that the Court assigned or attributed to that word three different and inconsistent meanings, as follows:

No. 1. "Stated in its simplest terms the force of this amendment is to require the manufacturers and sellers of fertilizers to state not only the percentage of each plant food element used in the manufacture and not only by the use of general terms the source of that element, but to state in addition the number of pounds of each particular source, or carrier used in each one hundred pounds of the mixture contained in the sack of fertilizer." (F. F. H. VII, p. 4.)

[fol. 254] No. 2. "We, therefore, have found as a fact that the analysis required in the sentence 'That the amount and analysis of each material, or source, of each plant food element used in the manufacture of a fertilizer mixture * * *' means that the major carrier shall be given, the percentage per hundred pounds of this major carrier be given, and that the analysis of this major carrier, so far as it contains any of the well recognized plant food elements (major or minor, when important, common or rare in occurrence) be stated." (F. F. M. I, pages 16-17.)

No. 3. "We find that the word 'analysis' as defined in the dictionary referred to above is as follows:

'The word "analysis" as applied to fertilizer, shall designate the percentage composition of the product expressed in terms of nitrogen or ammonia, phosphoric acid and potash

in their various forms.' (Definition submitted by the Committee on Definitions of Terms and Interpretations of Results on Fertilizers accepted for final adoption by the A. O. A. C., October 1926.)

We think, however, that as used in this Statute there should be another sentence added as follows:

'The analysis shall also designate the source or sources of the nitrogen or ammonia, phosphoric acid and potash, and with respect to the ammonia shall give full information as to solubility or insolubility'." (F. F. M. I, p. 18.)

The inconsistencies being: Meaning No. 1 correctly contemplates an analysis showing every plant food element, whether major or minor, contained in a fertilizer mixture; meaning No. 2, though the language is vague, apparently contemplates an analysis showing only the major plant food elements and such important minor plant food elements as may have been contained in a carrier furnishing a major plant food element; meaning No. 3 contemplates an analysis showing only the three major plant food elements.

[fol. 255] 26. The Court erred in its finding as to the meaning of the word "analysis" as follows: "We, therefore, have found as a fact that the analysis required in the sentence 'That the amount and analysis of each material, or source, of each plant food element used in the manufacture of a fertilizer mixture * * *' means that the major carrier shall be given, the percentage per hundred pounds of this major carrier be given, and that the analysis of this major carrier, so far as it contains any of the well recognized plant food elements (major or minor, when important, common or rare in occurrence) be stated", for the reasons that (1) such definition is arbitrary and is not justified by the record; (2) such definition is vague and indefinite; (3) the Court did not accept the dictionary definition, or that commonly accepted by chemists, or that adopted by the Association of Official Agricultural Chemists, or that adopted by any competent authority, but has formulated a new definition, which purports to interpret or explain the law but which in fact amounts to judicial legislation; and (4) the record shows that by no known method of chemical analysis of a fertilizer mixture can the sources of the plant

throughout the entire pile, for the reason that such a finding is contrary to the testimony and to well-known laws of physics. (F. F. P. IV, p. 14.)

24. The Court erred in finding: "The testimony shows that these costs (for occasional mixing of fertilizer according to a farmer's special formula) range from 50¢ per ton to $2.50 per ton. Such compensation has actually offset the extra expenses and trouble in the past, and the only reasonable conclusion is that approximately the same extra charge will offset the increased costs and trouble in the future," for the reason that such finding is not warranted by the testimony. (F. F. P. V, p. 14.)

25. The Court erred in its findings as to the meaning of the word "analysis" as used in the Open Formula statute, for the reason that the Court assigned or attributed to that word three different and inconsistent meanings as follows:

No. 1. "Stated in its simplest terms the force of this amendment is to require the manufacturers and sellers of fertilizers to state not only the percentage of each plant food element used in the manufacture and not only by the use of general terms the source of that element, but to state in addition the number of pounds of each particular source, or carrier used in each one hundred pounds of the mixture contained in the sack of fertilizer." (F. F. H. VII, p. 4.)

[fol. 254] No. 2. "We, therefore, have found as a fact that the analysis required in the sentence 'That the amount and analysis of each material, or source, of each plant food element used in the manufacture of a fertilizer mixture * * *' means that the major carrier shall be given, the percentage per hundred pounds of this major carrier be given, and that the analysis of this major carrier, so far as it contains any of the well recognized plant food elements (major or minor, when important, common or rare in occurrence) be stated." (F. F. M. I, pages 16-17.)

No. 3. "We find that the word 'analysis' as defined in the dictionary referred to above is as follows:

'The word "analysis" as applied to fertilizer, shall designate the percentage composition of the product expressed in terms of nitrogen or ammonia, phosphoric acid and potash

in their various forms.' (Definition submitted by the Committee on Definitions of Terms and Interpretations of Results on Fertilizers accepted for final adoption by the A. O. A. C., October 1926.)

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'The analysis shall also designate the source or sources of the nitrogen or ammonia, phosphoric acid and potash, and with respect to the ammonia shall give full information as to solubility or insolubility'." (F. F. M. I, p. 18.)

The inconsistencies being: Meaning No. 1 correctly contemplates an analysis showing every plant food element, whether major or minor, contained in a fertilizer mixture; meaning No. 2, though the language is vague, apparently contemplates an analysis showing only the major plant food elements and such important minor plant food elements as may have been contained in a carrier furnishing a major plant food element; meaning No. 3 contemplates an analysis showing only the three major plant food elements.

[fol. 255] 26. The Court erred in its finding as to the meaning of the word "analysis" as follows: "We, therefore, have found as a fact that the analysis required in the sentence 'That the amount and analysis of each material, or source, of each plant food element used in the manufacture of a fertilizer mixture * * *" means that the major carrier shall be given, the percentage per hundred pounds of this major carrier be given, and that the analysis of this major carrier, so far as it contains any of the well recognized plant food elements (major or minor, when important, common or rare in occurrence) be stated", for the reasons that (1) such definition is arbitrary and is not justified by the record; (2) such definition is vague and indefinite; (3) the Court did not accept the dictionary definition, or that commonly accepted by chemists, or that adopted by the Association of Official Agricultural Chemists, or that adopted by any competent authority, but has formulated a new definition, which purports to interpret or explain the law but which in fact amounts to judicial legislation; and (4) the record shows that by no known method of chemical analysis of a fertilizer mixture can the sources of the plant

foods used in making that mixture be determined. (F. F. M. I, p. 16.)

27. The Court erred in its finding as to the meaning of the word "analysis" as follows:

"We find that the word 'analysis' as defined in the dictionary referred to above (Moore's Dictionary of Fertilizer Materials) is as follows:

'The word "analysis" as applied to fertilizer, shall desinate the percentage composition of the product expressed in terms of nitrogen or ammonia, phosphoric acid and potash in their various forms.' (Definition submitted by the Committee on Definitions of Terms and Interpretations of Results on Fertilizers accepted for final adoption by the A. O. A. C., October, 1926.)

"We think, however, that as used in this Statute there should be another sentence added as follows:

[fol. 256] 'The analysis shall also designate the source or sources of the nitrogen or ammonia, phosphoric acid and potash, and with respect to the ammonia shall give full information as to solubility or insolubility.' "

for the reasons that (1) such definition is arbitrary and is not justified by the record; and (2) the Court did not accept the dictionary definition, or that commonly accepted by chemists, or that adopted by the Association of Official Agricultural Chemists, or that adopted by any competent authority, but has formulated a new definition, which purports to interpret or explain the law but which in fact amounts to judicial legislation; (3) the word "analysis" as used in connection with chemical determinations never contemplates an ascertainment or statement of the source or sources of the constituent elements of the substance analyzed; and (4) the record shows that by no known method of chemical analysis of a fertilizer mixture can the sources of the plant foods used in making that mixture be determined. (F. F. M. I, p. 18.)

28. The Court erred in finding: "In addition to supplying plant food the effect on the acid condition of the soil of several rare elements is of importance to the farmer", for the reasons that (1) the Court failed to find what are "rare elements"; (2) the Court failed to specify what

"rare elements" have the effect described in the quoted finding; and (3) the evidence does not support such finding but tends to show only that certain compounds of certain elements not among the three major plant food elements (notably the oxides and carbonates of calcium—lime and limestones—and the oxides and carbonates of magnesium—dolomitic lime and dolomite) have an effect on the acid condition of the soil. (F. F. R. XVII, p. 22.)

[fol. 257] 29. The Court erred in its conclusion of law numbered I in finding and holding that plaintiffs are not entitled to the relief sought in their bill and that the defendants are entitled to have the bill dismissed on its merits. (Conclusions of Law I, p. 1.)

30. The Court erred in its conclusion of law numbered II in finding and holding that plaintiffs are not entitled to the interlocutory injunction applied for. (Conclusions of Law II, p. 1.)

31. The Court erred in its conclusion of law numbered III in finding and holding that plaintiffs are not entitled to the permanent injunction prayed for, but that on the contrary the defendants are entitled to a decree denying the permanent injunction. (Conclusions of Law III, p. 1.)

32. The Court erred in its conclusion of law numbered V in finding and holding that the 1936 Amendment to the Fertilizer Laws of South Carolina is within the police power of the State and is a valid and reasonable exercise of such power and tends in a reasonable way to effect the object sought to be accomplished by the amendment. (Conclusions of Law V, p. 2.)

33. The Court erred in its conclusion of law numbered VI in finding and holding that the rights of the plaintiffs herein to their respective trade names, trade marks, and secret formulæ are all subject to and subordinate to the control of the aforesaid valid and reasonable exercise of the police power of the State of South Carolina, for the reason that the exercise of the police power of South Carolina as provided by said amendment is an invalid and unreasonable exercise of such power. (Conclusions of Law VI, p. 2.)

34. The Court erred in its conclusion of law numbered VII in finding and holding that the disclosures and revela-

[fol. 258] tions compelled by the amendment are reasonably necessary for the accomplishment of the purpose sought to be accomplished by the amendment and all reasonably tend to accomplish this purpose and that the necessity for such disclosures has a reasonable basis in the facts. (Conclusions of Law, VII, p. 2.)

35. The Court erred in its conclusion of law numbered VIII in finding and holding that the amendment reasonably construed is neither arbitrary, unreasonable, nor capricious, for the reason that the so-called reasonable construction put on the amendment by the Court is arbitrary, unreasonable, and capricious. (Conclusions of Law VIII, p. 2.)

36. The Court erred in its conclusion of law numbered IX in finding and holding that the amendment as construed by the Court is susceptible of being complied with in an honest and reasonably accurate manner and that such compliance will not impose such an unreasonable expense or hardship upon the plaintiffs as to amount to unreasonable control as a matter of law. (Conclusions of Law IX, p. 3.)

37. The Court erred in its conclusion of law numbered X in finding and holding that the amendment as construed by the Court is susceptible of being complied with in an honest and reasonably accurate manner and therefore does not amount to the taking of property of the complainants without due process of law and therefore does not violate the due process clause of the Fourteenth Amendment to the Constitution of the United States. (Conclusions of Law X, p. 3.)

38. The Court erred in its conclusion of law numbered XI in finding and holding that the amendment as construed by the Court is susceptible of being complied with in an honest and reasonably accurate manner and therefore violates none of the constitutional provisions of either the Constitution of the United States or of the State of South [fol. 259] Carolina relied on by plaintiffs. (Conclusions of Law XI, p. 3.)

39. The Court erred in its final decree in ordering and decreeing that the bill herein be dismissed and the relief sought denied and in denying the application for interlocutory injunction and the application for a permanent in-

junction against the enforcement of the 1936 amendment to the Fertilizer Laws of the State of South Carolina. (Final Decree, pages 1-2.)

40. The Court erred in stating, in the Opinion, that plaintiffs contend: "That the statute, couched in indefinite and inaccurate language, is incapable of reasonable enforcement", for the reason that such statement or finding is not supported by the record, plaintiffs' contention in this respect being that the statute is clear in meaning but is not enforceable. (Opinion, p. 7.)

41. The Court erred, in its statement, in the Opinion (page 7), of plaintiffs' contention numbered I, for the reason that the Court therein confused plaintiffs' contentions as to (1) enforcement and (2) compliance, and thereby deprived plaintiffs of one of their contentions, plaintiffs' contentions as shown by the record, in these respects being that: (1) The statute is unconstitutional because it is unenforceable; and (2) the statute is unconstitutional because compliance with it would be so expensive as to be unreasonable and to destroy plaintiffs' business. (Opinion, p. 7.)

42. The Court erred in stating as fact in the Opinion (page 10): "It is important to note that several of the key phrases in this Statute have occurred from time to time in previous statutes regulating the fertilizer business and have been given a reasonable and sane construction by the [fol. 260] enforcing agencies. We take occasion at this point in our Opinion to call particular attention to this matter because we think that it is vital to the correct understanding of our decision. • • • It is significant to here point out that even where the phrase 'chemical analysis' has been used in previous statutes, such chemical analysis has been construed to be sufficient if it shows the three major plant foods with which the farmers were familiar and about which they desired knowledge in making their choice of fertilizers", for the reasons that (1) the phrase "chemical analysis" has not been used and does not occur in any previous statute; and (2) the record does not show that enforcing agencies or administrative agencies have ever had occasion to construe, or ever have construed, any key phrase or word occurring both in the Open Formula Statute and in a previous statute. (Opinion, p. 10. See Code, sections 6365-6385.)

43. The Court erred in finding and holding, in the Opinion (page 12), that a statement on the tag showing the general average with respect to all items of information contained on the tag coming from an honest desire to make the storage pile of fertilizer of uniform composition would be a compliance with the Open Formula Amendment, for the reason that the amendment requires the tag to show the actual number of pounds and the actual analysis of materials used in manufacturing mixed fertilizer contained in the sack. (Opinion, p. 12.)

44. The Court erred in stating as fact in the Opinion, in connection with its discussion as to enforced disclosure of secret formulas through the exercise of the police power by a State and in support of its position in that respect: "The control of proprietary medicines by State and National is an exact analogy. If secret formulæ of medicines [fol. 261] for human consumption can be forced to revelation in the exercise of police power it seems to follow, as night the day, that secret formulæ with respect to the supply of plant food must likewise yield to a reasonable and valid exercise of police power," for the reason that there is nothing in the record to support the implication or statement that State and National laws require the disclosure of secret formulas of medicines, and for the further reason that no State or National law in fact requires disclosure of such secret formulas, the disclosures required by State and National laws with respect to formulas of medicines being limited to disclosures as to the presence and quantity of alcohol and of such substances as are poisonous, deleterious, and habit-forming. (Opinion, p. 17.)

45. The Court erred in finding as fact, in the Opinion (page 19), that the plaintiffs have not shown that it would be impossible for them to comply with the Open Formula Statute as to stocks of fertilizer manufactured prior to the enactment of the statute and now on hand, for the reason that the record shows that it would be impossible for the plaintiffs to comply with the statute as to such fertilizer. (Opinion, p. 19.)

46. The Court erred in finding as fact, in the Opinion (page 19): "We feel, too, that under the testimony we could dispose of this contention because of the small amount of fertilizers on hand when viewed in comparison with the enormous business done by the plaintiff companies. The amount

of fertilizers on hand is so small as hardly to merit special consideration, and certainly the whole act will not be declared invalid on account of the remnants in the hands of a few companies", for the reason that the record does not support such finding but shows, on the contrary, that at least some of the plaintiffs have on hand considerable quantities [fol. 262] of fertilizer manufactured prior to the enactment of the statute, one of the plaintiffs alone having on hand approximately 4,200 tons worth about $75,000. (Opinion, p. 19.)

47. The Court erred in failing to find and hold that the Open Formula Act would be unenforceable, for the reason that the record shows that there is no method by which the number of pounds and analysis of each material used in the manufacture of a fertilizer mixture can be determined after the mixture has been made.

48. The Court erred in failing to find from the record and hold that the expense of complying with the statute, including that arising from the building of larger plants, the inauguration of more elaborate systems of bookkeeping, the preparation of tags, the installation of additional machinery and the employment of more superintendents and laborers, would be unreasonable and so great as to render the cost of manufacture of fertilizer so excessive as practically to destroy plaintiffs' business and thereby take away their property without due process of law.

49. The Court erred in failing to find from the record and hold that a number of the plaintiffs had on hand, when the Open Formula Act became effective, substantial quantities of fertilizer manufactured prior to the passage of the Act; and that as to such fertilizer it would be impossible for them to comply with the Act, as there is no known method of analysis by which the amount and analysis of the source-materials used in the fertilizer could be ascertained after the same have been mixed, nor did they have knowledge or records of such information, and that therefore the salability and value of such property would be completely [fol. 263] destroyed by the enforcement of the Act and thereby plaintiffs' property would be taken without due process of law.

50. The Court erred in failing to find, unqualifiedly, from the record, and to hold that plaintiffs own secret formulas,

according to which they manufacture fertilizer which they sell under trade-names, trade-marks, and brands; that such formulas, trade-names, trade-marks, and brands constitute valuable property rights entitled to full protection under the law; and that enforcement of the Open Formula Amendment would deprive them of such property rights without due process of law.

51. The Court erred in failing to find from the record and hold that the compulsory disclosure of plaintiffs' secret formulas required by the Open Formula Act would take away valuable property rights of the plaintiffs in such formulas without legal justification and thereby deprive them of their property without due process of law.

52. The Court erred in failing to find and hold that there is no public necessity for the Act, for the reason that the record shows that the information required to be given by the South Carolina Fertilizer Law without the Open Formula Act is sufficient to serve the purposes intended to be served by that Act, namely, to protect the farmer and to enable him to buy fertilizer intelligently for his individual needs.

53. The Court erred in failing to find and hold that there is no public necessity for the Act, for the reason that the record shows that if information in addition to that required by the South Carolina Fertilizer Law without the Open Formula Act should be thought desirable to protect the farmer and to enable him to buy fertilizer intelligently for his individual needs, such information can be provided for [fol. 264] by legislation that will not deprive the plaintiffs of their property without due process of law by destroying the salability of goods manufactured before the enactment of the amendment, or by necessitating unreasonable expense for compliance, or by arbitrarily requiring a disclosure of their secret formulas.

54. The Court erred in failing to find and hold that there is no public necessity for the Open Formula Act, for the reason that the record shows that, under the South Carolina Fertilizer Law without the Act, any farmer can have fertilizer mixed for him in exact accordance with his own specific formula and consequently that the Act is not necessary to enable the farmer to obtain a fertilizer as to which he knows the number of pounds and analysis of each material used.

55. The Court erred in failing to find from the record and hold that the Open Formula Act would impose a heavy burden upon the plaintiffs without giving any corresponding benefit to users of fertilizer and that such burden would, therefore, be an unreasonable one and would deprive plaintiffs of their property without due process of law.

56. The Court erred in failing to find and hold that the Open Formula Amendment is unconstitutional for the reasons that, as shown by the record, (1) it is unenforceable; and (2) it would deprive plaintiffs of their property without due process of law by destroying the salability of goods manufactured before the enactment of the amendment, by necessitating unreasonable expense for compliance and by arbitrarily requiring a disclosure of their secret formulas.

[fol. 265] In these Assignments

1. "F. F. H." means Findings of Fact as to the "History and Background of the Suit", contained in the Court's "Findings of Fact and Conclusions of Law."

2. "F. F. R." means "Findings of Fact as to the Reasonableness of the Regulations Contained in the 1936 Amendment, and as to its Relations to the Purpose of the Amendment," contained in the Court's "Findings of Fact and Conclusions of Law."

3. "F. F. P." means "Findings of Fact as to the Possibility of Supplying the Information Required by the Act in an Honest and Reasonably Accurate Manner, and Further Findings as to the Increased Cost of Manufacturing and Marketing Which will Result from Observance of the Requirements of the Act," contained in the Court's "Findings of Fact and Conclusions of Law."

4. "F. F. M." means "Finding of Fact as to the Meaning of the Word Analysis as Used in the Amendment Under Consideration Together with Supporting Discussion," contained in the Court's "Findings of Fact and Conclusions of Law."

5. "F. F. T. M." means "Findings of Fact as to Trade-Marks, Trade Names and Secret Formulæ" contained in the Court's "Findings of Fact and Conclusions of Law."

6. "Code" means "Code of Laws of South Carolina, 1932."

[fol. 266] Bond on Appeal for $5,250, approved and filed, omitted in printing.

[fol. 267] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

ORDER EXTENDING TIME TO FILE TRANSCRIPT OF RECORD—Filed January 21, 1937

Good cause appearing therefor, and upon motion of W. C. McLain, Attorney for the Appellants herein, Attorneys for Appellees acquiescing, it is hereby

Ordered that the appellants be, and they hereby are, granted twenty days additional time from and after the date fixed in the "restraining order pending appeal to the Supreme Court of the United States," filed December 23, 1936, within which to file the certified copy of the record on appeal herein in the office of the Clerk of the Supreme Court of the United States, and that the restraining order pending appeal above referred to be modified in conformity with this order.

John J. Parker, U. S. Circuit Judge; H. H. Watkins, U. S. Dist. Judge; J. Lyles Glenn, U. S. District Judge.

Columbia, S. C., 19th January, 1937.

[fol. 268] Service of the within order acknowledged and copy retained.

John M. Daniel, J. Ivey Humphrey, Harold Major, Attorneys for Defendants.

[fol. 269] IN UNITED STATES DISTRICT COURT

[Title omitted]

PETITION FOR APPEAL AND PRAYER FOR REVERSAL

To Honorable J. Lyles Glenn, United States District Judge:

Petition for appeal herein was filed and allowed on the 14th day of December, 1936. At that time, however, it was

physically impossible to have the assignments of error accompany the petition for appeal.

Assignments of error have now been filed and are hereto attached, and the bond on appeal and for costs has been approved.

Wherefore, considering themselves aggrieved by the decision and decree of the Court of three judges convened in the above entitled case pursuant to section 266 (U. S. Code Annotated, Title 28, Sec. 380) of the Judicial Code, the plain-
[fol. 270] tiffs herein hereby pray that their appeal be reallowed to the Supreme Court of the United States, and that the bond for costs and on appeal heretofore deposited be reapproved.

Prayer for Reversal

For the errors assigned in the attached "Assignment of Errors" the plaintiffs herein pray that the said decree of the District Court of the United States for the Western District of South Carolina, filed December 9, 1936, in the above entitled cause, be reversed and a decree rendered in favor of said plaintiffs, and for costs.

(Signed) W. C. McLain, Solicitor for Plaintiffs.

In United States District Court

Order Allowing Appeal

And now, to-wit: on January 26th, 1937, having read and considered the above petition for appeal and the attached Assignment of Errors, the former order of this Court allowing appeal herein is now confirmed and the appeal is hereby reallowed and the cost bond and bond on appeal heretofore filed are hereby reapproved.

(Signed) J. Lyles Glenn, United States District Judge.

Service accepted this 28th day of January, 1937.
John M. Daniel, J. Ivey Humphrey, Harold Major, Attorneys for Defendants.

[fols. 271-272] [File endorsement omitted]

IN UNITED STATES DISTRICT COURT

[Title omitted]

ORDER FOR TRANSMITTAL OF EXHIBITS—Filed Feb. 2, 1937

It appearing that certain exhibits were introduced in this cause which are incapable of being printed, or which need not be printed, but which should be considered in determining the questions raised, it is, therefore, by agreement of counsel, ordered that the Clerk of this Court do transmit to the United States Supreme Court as a part of the record on appeal herein such of the original exhibits as may be designated in writing by counsel for appellants and appellees.

(Sgd.) J. Lyles Glenn, United States District Judge.

February 2nd, 1937.

[fol. 273] [File endorsement omitted]

SUPREME COURT OF THE UNITED STATES

[Title omitted]

STIPULATION AS TO CONTENTS OF TRANSCRIPT OF RECORD—Filed January 29, 1937

It is hereby stipulated and agreed by and between the solicitors for the respective parties that the transcript of record to be filed in the Supreme Court of the United States pursuant to the appeal heretofore allowed herein shall include the following:

1. Bill of complaint, subpœna and exhibits, without returns of marshal.
2. Answer and exhibits, without returns of marshal, if any.
3. Order convening three judge court.
4. Order of three judge court passed at Greenville, South Carolina, hearing.
5. Narrative of testimony hereto attached.

6. Affidavits hereto attached.
7. Exhibits introduced at final hearing.
[fol. 274] 8. Opinion.
9. Findings of fact and conclusions of law.
10. Final decree.
11. Petition for appeal and order of allowance.
12. Order continuing temporary restraining order.
13. Statement as to jurisdiction.
14. Original citation.
15. Assignments of error.
16. Statement as to bonds filed.
17. Order extending time to file Transcript of Record.
18. Second petition for appeal and orders thereon.
19. Order for transmission of certain original exhibits.
20. This stipulation.

(Signed) W. C. McLain, Solicitor for Plaintiffs.
(Signed) John M. Daniel, Attorney General; J. Ivey Humphrey, Assistant Attorney General; M. J. Hough, Assistant Attorney General; Harold Major, W. C. Wolfe, Solicitors for Defendants.

[fol. 275] Clerk's certificate to foregoing transcript omitted in printing.

[fol. 276] SUPREME COURT OF THE UNITED STATES

STATEMENT OF POINTS TO BE RELIED UPON AND DESIGNATION TO PRINT ENTIRE RECORD—Filed February 11, 1937

Come now the appellants and adopt their assignments of error as their statement of the points to be relied upon and represent that the whole of the record, as filed and designated in the stipulation, is necessary for the consideration of the case.

(Signed) W. C. McLain, Solicitor for Appellants.

Due service of the foregoing is hereby admitted.
(Signed) John M. Daniel, J. Ivey Humphrey, M. J. Hough, Harold Major, W. C. Wolfe, Solicitors for Appellees.

[fol. 277] [File endorsement omitted.]

Endorsed on cover: File No. 41,271. W. South Carolina, D. C. U. S. Term No. 731. The National Fertilizer Association, Inc., Acme Manufacturing Co., et al., Appellants, vs. W. W. Bradley, Individually and as Chairman of the Board of Trustees of Clemson Agricultural College, et al. Filed February 11, 1937. Term No. 731, O. T. 1936.